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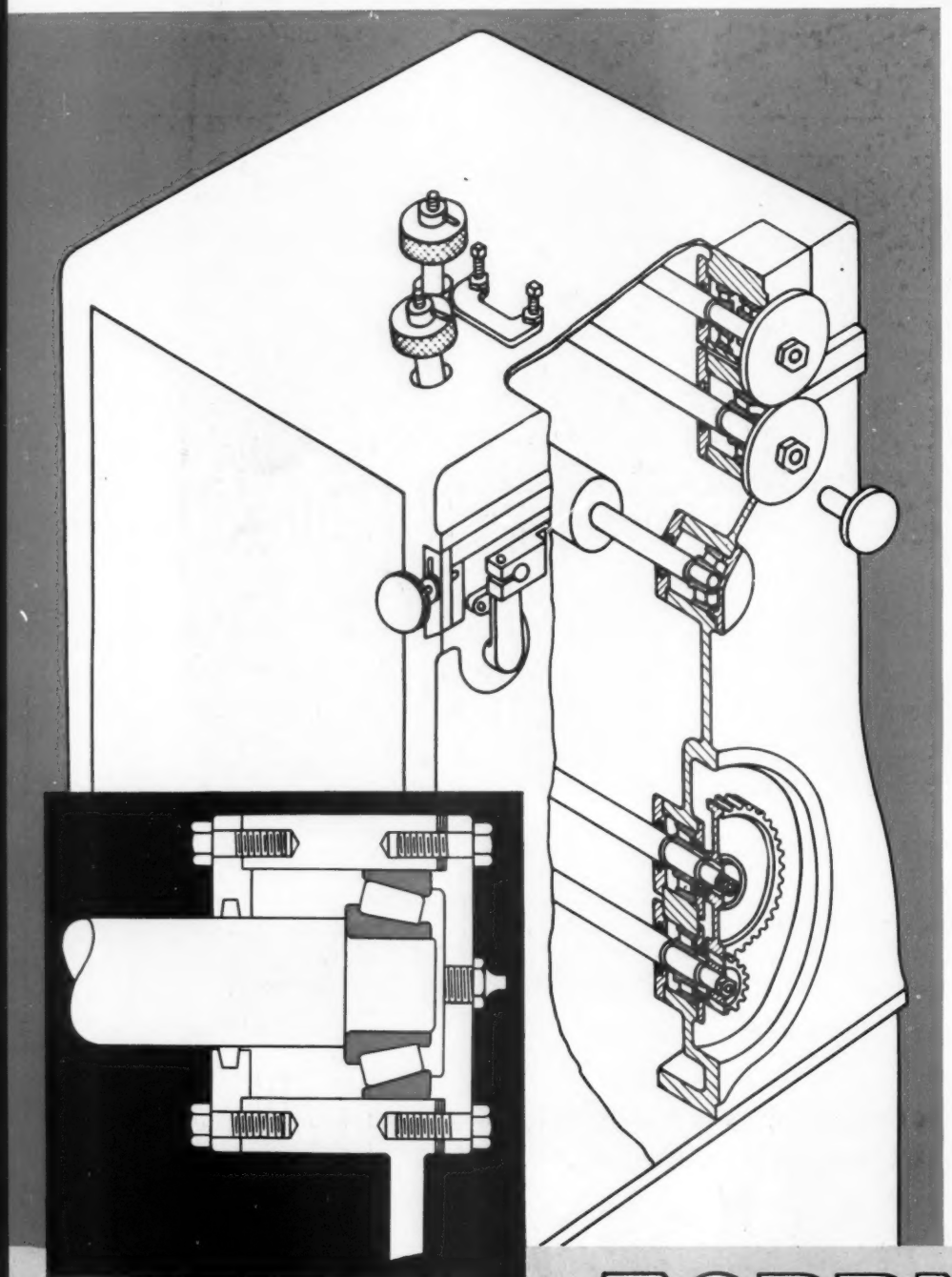

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W-12 SEGMENT TYPE COILER

Left — Torrington W-12 Spring Coiling Machine, one of five models in the Segment Type series designed for high-speed production of springs requiring limited lengths of wire. This model has wire diameter range from .062" to .148" and will coil springs from 0" to 60" in length (0" to 120" with smaller sizes of wire)

W-20 CLUTCH TYPE COILER

Right — Torrington W-20 Spring Coiling Machine, one of five models in the Clutch Type series particularly adapted for springs requiring long lengths of wire. Production of short length springs is slightly less than on Segment Type machine. Model shown has wire diameter range from .008" to .028" and will coil springs from 1.4" to 665" in length. Larger sizes have wire diameter range up to .500".

We would welcome the opportunity to tell you more about Torrington Spring Machines. Bulletins giving detailed specifications will be sent on request or, if you prefer, a representative will call to explain Torrington machines and service.

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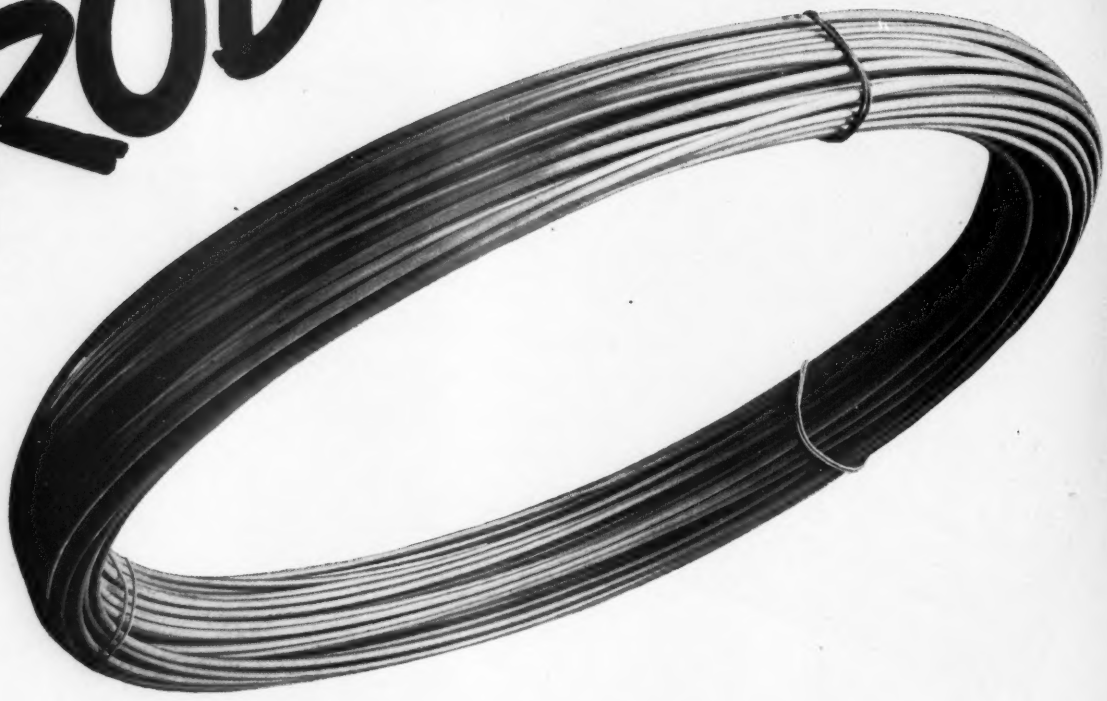
ROD STORY



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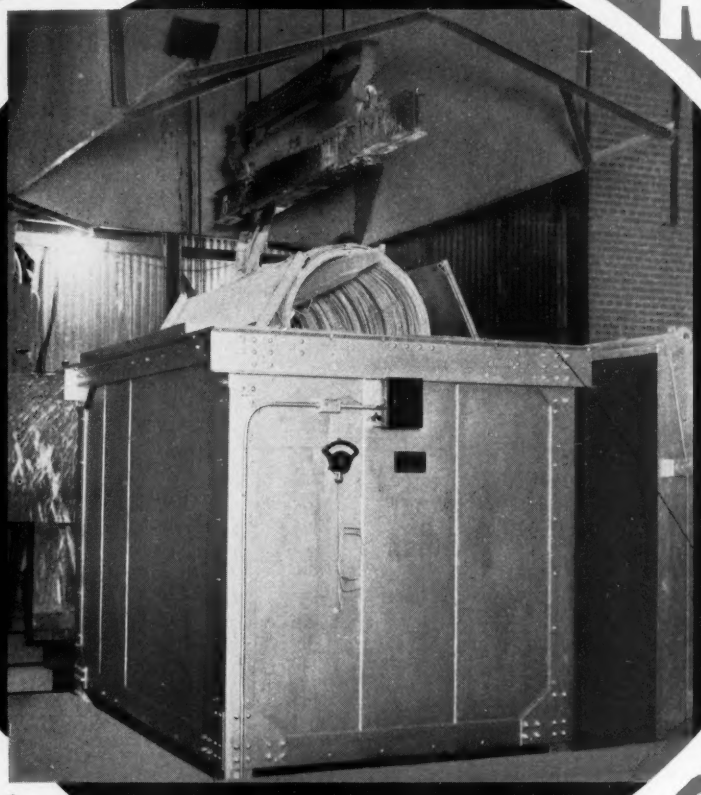

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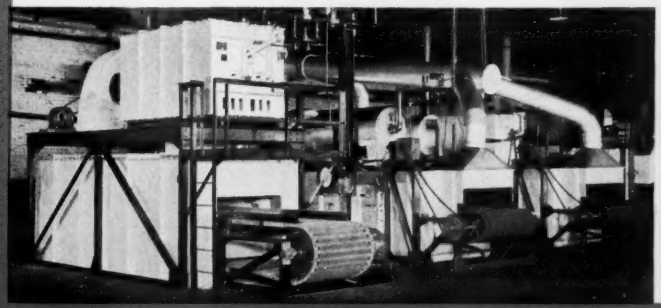

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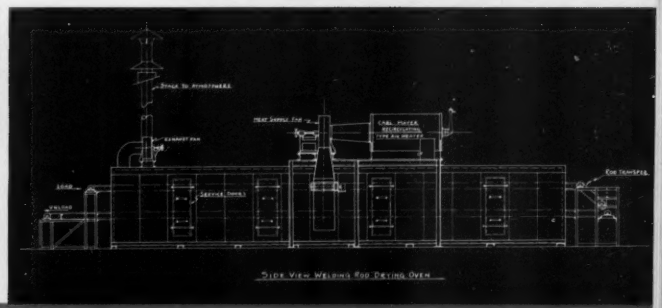

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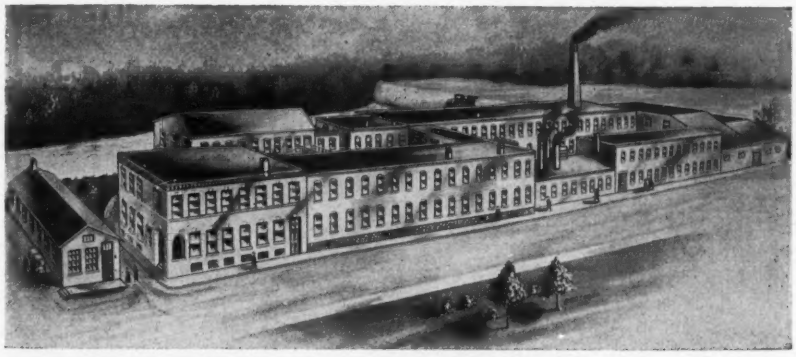

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"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from Selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing. BETTER WIRE AT LOWER COST.

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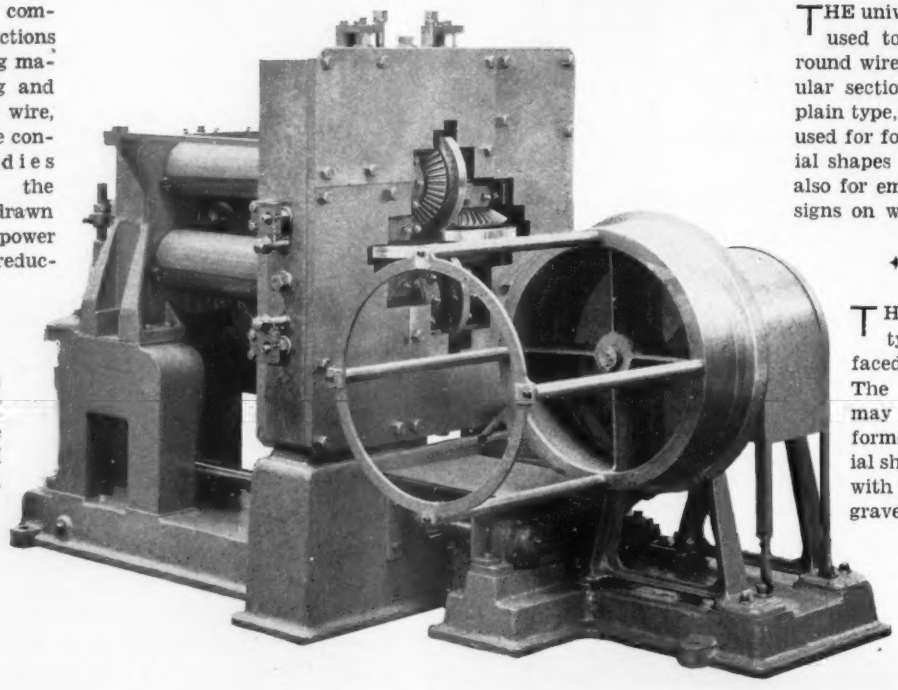
Unequalled for Forming Rectangular Stock and Special Shapes

THIS machine combines the functions of a wire drawing machine for pulling and for bundling the wire, but instead of the conventional type dies through which the wire is usually drawn it provides power driven rolls for reducing the stock.

✦ ✦ ✦

THESE "Turk's heads," are of two types, the plain type and the universal type.

✦ ✦ ✦



THE universal type is used to convert round wire to rectangular sections, and the plain type, so-called, is used for forming special shapes of wire and also for embossing designs on wire.

✦ ✦ ✦

THE universal type has flat-faced rolls only. The plain type may have rolls formed for special shapes or rolls with designs engraved on them.

Write for Detailed Information

STANDARD MACHINERY CO.

PROVIDENCE, R. I.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 14 NOVEMBER, 1939 No. 11

Designated as

Official Publication By The Wire Association

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ANNOUNCEMENT

of the

SPECIAL ISSUE

for

JANUARY, 1940

SPECIAL BECAUSE:

The discussions on technical papers at the annual meeting of the WIRE ASSOCIATION will be published in their entirety in the regular January issue of WIRE and WIRE PRODUCTS.

+ + +

The directors of the WIRE ASSOCIATION have approved this plan to provide these discussions to all subscribers without extra expenditure.

+ + +

TO OUR ADVERTISERS:

The advertising value of this special arrangement to be followed in the January issue of WIRE and WIRE PRODUCTS is obvious.

+ + +

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip. Wire Products and Insulated Wire and Cable.

DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 14 NOVEMBER, 1939 No. 11

Wire In War

By Major General Joseph O. Mauborgne,

Chief Signal Officer of the Army,

Washington, D. C.

An address with specific reference to wire needed for communication purposes by the Signal Corps delivered at the Annual Meeting of the Wire Association at Chicago, Illinois, October 25, 1939. ✦ ✦ ✦

Foreword

BECAUSE the title of my address today, "Wire in War," may sound ominous to some of my listeners, I wish to preface my remarks with the reassurance that the thoughts that I am going to present to you today are not in any way inspired by the existing world situation, nor can they, by any stretch of the imagination, be taken as a sudden appeal to the wire industry to extend production planning for war materials on the entirely unwarranted assumption that any of us in the government service is convinced that the United States is about to be catapulted into war.

✦ ✦ ✦

IF any of my listeners have such an idea, I suggest that you put such idea and your Army uniforms back in moth balls. What I have to say today about the necessity for efficient procurement planning for the production of wire during any war was as equally applicable a number of years ago as it is today. Specifically, I shall make an attempt to give you a picture of the steps that we are taking to review our production planning in order to secure correct estimates of your capabilities for production, to give you some idea of the liberalization of specifications which we are attempting in order to circumvent bottlenecks in production, and finally, the means the War Department is devising to extend the education of sources capable of producing the specified types of wire required by the Army for training in peace and use in war.

✦ ✦ ✦

The Importance of Wire In War

THE importance of wire in war is illustrated by the fact that the direct requirements of the War Department alone embrace 337 separate items of wire and wire products, stretching from wire and cable for aircraft, barbed wire for entanglements, communication wire and cables of all sorts, down to wire nails.

✦ ✦ ✦

THE Navy Department also has tremendous demands for wire and wire products in war. The combined requirements of the Army and Navy reach into almost every department of the wire industry for fabrication.

✦ ✦ ✦

BECAUSE limited by time, my discussion today, however, will necessarily be confined to consideration of the wire for communication purposes only, needed by the Army.

✦ ✦ ✦

DURING the World War I was one of those officers considered by many "unlucky," who were selected to fight "The Battle of Washington" instead of being on the Western Front. I happened then to be in charge of what was called the Engineering and Research Division of the Office of the Chief Signal Officer, where I

had occasion to review the requisitions for Signal supplies which arrived from General Russell, Chief Signal Officer of the American Expeditionary Forces, whose demands for wire to be used in the front areas grew to such extent that he finally summarized it in one cablegram — "What we want is **mountains** of wire." Any other war of similar proportions will produce similar requirements. We will need simply "mountains of wire," particularly when we realize the increased frequency of air raids and the consequent destruction of communications not dreamed of during the World War of a quarter of a century ago.

✦ ✦ ✦

THOUGH unbelievable progress in communications has been achieved and changes have been made both remarkable and catastrophic in their influence, yet wire continues to carry the dominant load of world and more particularly, military communications. Just as wires and cables are the means of conveying information and control in commercial life, so also are wires and cables the means of coordinating and controlling the military machine. As civilization becomes more complex, so also does an army become more complex and the more it depends upon quick and sure signal communications. Wire communications are, by and large, the surest of all signal communications.

✦ ✦ ✦

WIRE is the primary component upon which wired communication is based. While your dominant interest in wire is, I presume, in connection with the primary steps in production, the Army's interest is concerned principally with the fundamental product further processed into the specialized field of communication wire. The common ground where our interests meet is, ultimately, in the use of this wire. For without the primary steps of production, wire could not exist; without the finishing processes applied to the wire, wired communication could not exist. Both your interests and the Army's are concerned not only with the production of the wire, but also the success with which it can be utilized.

✦ ✦ ✦

Communication Wire Procurement Problems

IT is the responsibility of the Signal Corps under my direction to procure all communication wire required by the Army in an emergency. I do not intend to present any figures as to the total requirements, but they are enormous and at the present time appear to be somewhat beyond the resources of the wire manufacturers of this country unless steps are taken to make more effective arrangements and secure the cooperation of the manufacturers to enable a greater output of specialized types of wire needed by the Army in a major war.

✦ ✦ ✦

THE Signal Corps procurement program involves the procuring of every Signal Corps item that will be required in an emergency, in the quantities when and where needed. There are approximately 30,000 items of Signal equipment. These items are divided into six basic classifications, the first of which is wire and cable, which is further subdivided into bare wire, insulated wire, lead covered cable, armored cable and switchboard cable. There are 264 Signal Corps types of wire and cable that have characteristics peculiar to their specific uses and which it is believed will involve procurement problems in an emergency. These problems have been approached along the following lines. Specific types and items of Signal Corps wire and cordage have been broken down into the manufacturing processes that are required in order to produce the item, and the processes have been tabulated showing the quantity required per month. You executives have estimated the capacity of your plants for each of the processes required. These requirements have been balanced against the estimated capacity for each of the processes so that the bottlenecks could be definitely recognized. Recognition of the bottlenecks leads to methods for the elimination of the bottlenecks and in many cases affects the courses of development of the product.

✦ ✦ ✦

Specification Requirements

BACK of the development of Signal Corps wire is the actual experience of ordinary types of wire when used near high explosive shells. Ordinary wire breaks, becomes entangled, loses its characteristics when shells explode near the lines. The degrees of ruggedness and durability of commercial type wire are naturally not that of a wire developed specifically for wartime use. A wire for wartime use in the field must be capable of withstanding the severest mechanical usage and at the same time give a high grade of electrical transmission without electrical leakage to the ground. It must lie inert on the ground and not become entangled by marching men, horses, tanks and guns. It must be rugged and durable and remain efficient under all circumstances. Existing military types of wire, while not perfect from a military point of view, are characterized by unusual strength, flexibility and insulation.

✦ ✦ ✦

Types of Combat Wire

DURING the World War our so-called field wire was known as Wire W-40. It was an 11-strand conductor insulated and braid covered, much heavier than the post war type. During the War it was not produced in sufficient quantities to meet the pyramiding demands of the American Expeditionary Force in France. The report of the Chief Signal Officer to the Chairman of the War Industries Board on October 25, 1918 contained the following remark with reference to the production of field wire: "The best production which has been reached thus far in any single month is 8,000 miles and this figure must be increased without delay to 65,000."

✦ ✦ ✦

OUR records show that the Armistice found the American

Expeditionary Force with less than five days' supply of field wire between them and a suspension of operations. Fortunately, a solution of this highly unsatisfactory condition did not have to be found.

✦ ✦ ✦

DURING the course of World War operations, an immediate demand arose for a still lighter wire than field wire for up-front use so a 7-strand conductor, the forerunner of Wire type W-44, having what proved to be light rubber and cotton insulation was produced. This wire failed to meet the field requirements of operating efficiency under adverse weather and rough handling conditions. Many caustic comments were received from the troops in the field about the unsuitability of this light wire for field use. In fact, it was universally referred to as "Sunshine Wire" because it operated only when there was no rain or when the ground was dry.

✦ ✦ ✦

THE failure of wire manufacturers of the United States to produce sufficient amounts of field wire to meet the A. E. F. demands caused the Signal Corps to resort to the shipment of the well known commercial telephone type of wire known as No. 17 outside distributing twisted pair. This wire was collected from every possible source in the United States including the small local warehouses of telephone companies all over the country. Then it was boxed and sent to the battle fields of France where the American soldier took a coil of it over his shoulder and laid it by hand over the battle ground. Because of its size it could not be laid from the reels provided for the field wire which it supplanted. This wire never was considered as anything but a very poor substitute for field wire and never again should be sent to the battle fields if suitable field wire can be provided. Proper procurement planning in advance of the World War would have gone far toward the production of the desired field wire in the quantities and at the time needed by the American Army in France.

Wire W-110

IN the post-war period our efforts were turned toward securing a product that would satisfy the military requirements and was capable of being manufactured by normal commercial production methods. Our field wire then became known as Wire W-110, replacing both our former Field Wire W-40 and our Outpost Twisted Pair W-44, the successor to the so-called "Sunshine Wire" of the World War. The early Wire W-110 required that the steel wire be acid processed instead of basic processed steel. Later planning disclosed the fact that requiring the acid steel wire would cause bottlenecks, cross hauls and confusion in our emergency production. The specification for this particular type of field wire was then liberalized to include either basic or acid steel and written around a performance specifying tensile strength and the like. Wire W-110 consisted of a conductor of steel and copper wires, concentrically stranded, coated, rubber-covered, braided, saturated, and twisted. A survey of productive capacity of the nation showed the bottleneck to be the stranding process which required Larmuth type of fine wire concentric stranders. In an effort to relieve this bottleneck and to take advantage of the added capacity for insulating resulting from the introduction of the new continuous vulcanizer, the specification was further liberalized to permit the bunching, laying, or fine wire concentric-stranding of the wires making up the conductor.

✦ ✦ ✦

Result of Specification Changes

THIS liberalization of the specification shifted the bottleneck from fine wire stranding to what is now believed to be drawing the steel strand and the process of coating the various wires of the conductor with a metal or an alloy designed to prevent rusting of the steel wire and electrolysis between copper and steel wires. In an effort to reduce the emergency requirements for tin, a strategic material, it was believed advisable to change the former method of coating provided in the specification of tinning the conductor and permitting galvanizing as well. In fact, provision was then made for the coating of both the steel and copper strands with tin, cadmium, zinc, or lead, or alloys of those metals, so as to stand the "Salt-Spray" test. The laboratory tests of the galvanized coating indicated that it was preferable to have the specification require only galvanized steel wire. Recently, this matter of galvanizing only has become a matter of concern to some manufacturers because of the apparent bottleneck resulting from the paucity of plants prepared to utilize this galvanizing process. As soon as it was brought to my attention, I directed that a study be made for the purpose of liberalizing the specifications so as to permit alternative methods of coating if practicable.

✦ ✦ ✦

Wire Type W-130

ALTHOUGH the Wire W-110-B is our standardized type of field wire, efforts are being directed towards utilizing the latest developments in the industrial field for producing a lighter weight, electrically satisfactory field wire, termed "assault wire", to which the type designation, Wire, Type W-130, has been given, whose general characteristics would be as follows: composed of two stranded conductors, separately insulated and twisted together; weight not to exceed 30 pounds per twisted pair mile; satisfactorily talking range with standard telephone accessories of at least 5 miles, and to be capable of maintaining this talking range under all weather conditions for at least 48 hours; tensile strength to be not less than 50 pounds per conductor and flexibility to be not less than that of Wire W-110.

✦ ✦ ✦

SAMPLES of assault wire approximating the characteristics mentioned above have been made for laboratory and service tests. The laboratory tests of most of these samples were very promising and orders were then placed for a number of miles of wire of each type for actual service tests in the field. These tests are now being carried on and it is not known

to date exactly what type of wire will be finally adopted as "Standard." Suffice it to say, that the Signal Corps has been interested in securing a wide variety of types of insulations; hence the field tests are being conducted on extruded-rubber insulation, dipped-rubber insulation, and synthetic insulation.

✦ ✦ ✦

Production Difficulties

A DIFFICULTY that I am anticipating in connection with the adoption of any of these light assault wires, particularly if they have an insulation requiring dipping rather than extruding, will be in connection with stranding, since the conductor must be a fine wire of a type that will lie on the ground without kinking and will still stand up under unusually rough field usage. Although the manufacturers would be free to either strand the wire or bunch it, it is believed new techniques will be required to be developed before manufacturers could insulate with the dipping method unless the conductors had previously been stranded. While manufacturers have been permitted considerable leeway in methods and processes utilized in the fabrication of the product submitted for service tests, yet a strict adherence to the electrical requirements of the specification is being demanded.

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EVERY effort is made to keep the cordage and wire standards as similar as possible to commercial counterparts, but our needs are different from the commercial requirements, as all of our equipment is portable and must be in working order under all conditions; namely, climatic conditions from extreme cold to extreme heat, rough field usage and especially requirements for fighting planes, tanks, combat cars and the like. An inferior product failing to function might not only cause the destruction of aircraft of great cost, but the lives of the operating personnel, as well as jeopardizing the entire military mission of the aircraft in question. Although the specifications for cordage and wire which we use may in some cases be such as to enable only a small fraction of the manufacturers to produce the particular item, the urgency and peculiar conditions surrounding its use make the adoption of such stringent requirements in the specification necessary.

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Educational Orders

PROCUREMENT Planning must be real. For example, one of our Planning Officers at one time sent in estimates of wire production which, in the face of our experience in war, might be considered over-optimistic. It is necessary to scrutinize such estimates and to be certain that they are based on machines and capacity hours instead of on patriotic good will and hopes. Even though my Planning Officer knew the types of machines required to make this field wire, saw them in the plant, and had faith in the management, it was agreed by the Planning Officer and the management that the only actual proof that this particular item could be manufactured would be actually to do it by giving the manufacturer a small trial order.

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THE same thought was in the mind of The Secretary and The Assistant Secretary of War, who have been instrumental in finally bringing about the placing of Educational Orders, and now for the first time the Signal Corps will be able to place trial orders for field wire.

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THE general objective of the Educational Orders Program, as you know, is to prepare industry for the war production scheduled to it by procurement plans. In some cases it may be possible under the educational order to prepare a plant quite completely for its war mission. The minimum that is expected is one set of special equipment, with drawings, specifications, patterns, etc., permitting duplication, and such production and engineering data as is possible of development in time of peace to reduce to a minimum the time to get into quantity production in war.

MORE specifically, the Signal Corps Program will be aimed at educating a number of manufacturers in actually producing a small quantity of field wire and in securing production data that will be useful in reducing the time that will be required in order to get into the quantity production of this field wire in an emergency. It is hoped that the production analysis that will be secured will provide: for a plan for any necessary conversion of the plant, an itemized list of new machines, manufacturing aids, special tools, etc. that will be required, together with a schedule of components or accessories to be supplied from outside sources and work to be performed by subcontractors, and preferred sources of such materials or services. The elimination of bottlenecks resulting from a paucity of sub-contractors will be a primary objective.

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EXPRESSED in a different way, it is my hope that through educational orders not only will several manufacturers actually make the war item but we will have a practical check on the Signal Corps Procurement planning and plane; a manufacturers' flow chart to check against our planners' flow chart, showing the quantity, where and when the steel rod is drawn into steel wire and coated; the quantity, where and when the copper rod is drawn into copper wire and the quantity, where and when the copper and the steel wires are laid or bunched or stranded, rubber-insulated, braided, saturated and twinned, and even a check on the quantity, where and when the steel reels upon which the wire will be reeled. A further study of the producers' analysis and flow sheets and our planners' flow chart will prevent cross hauls, eliminate bottlenecks and give greater assurance that the source of contributory items and raw materials will be secure.

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Conclusion

IN these uncertain times it is indeed gratifying to know that the Army has the active support of the Wire Industry in attacking the war procurement problem. It

(*Please turn to Page 667*)

Award of Annual Medal By The Wire Association

Wire Association awards Annual Medal to Stanley P. Watkins ✦ ✦ ✦ The Annual Presidential Message ✦ ✦ ✦ Full details of meeting to be published in December issue of Wire and Wire Products. ✦

AT the Special Meeting of the Board of Directors of the Wire Association held at Chicago, Illinois, Monday, October 23, 1939, in connection with the Annual Convention of the Association, the Annual Medal Award "For the Most Meritorious Paper on Wire Manufacture or Fabrication submitted during the year by a member of the Association," was made to Stanley P. Watkins, Manager, Sales Development, Rustless Iron & Steel Corporation, Baltimore, Maryland. The paper was entitled "Manufacture and Use of Stainless Steel Wire," and was published in the October, 1939 issue of WIRE AND WIRE PRODUCTS.

✦ ✦ ✦

THE full details of the meetings will be published in the December issue of WIRE AND WIRE PRODUCTS, because the date of going to press precludes their publication at this time. However, the address by the President of the Association, published herewith, gives the keynote of the meetings. Mr. Westphal, the President, said:

✦ ✦ ✦

Gentlemen:

HEREWITH is my second presidential message to you on this, the ninth Annual Convention of the Wire Association. It is fitting that you be informed of the progress made, as a result of the united and harmonious action of the Officers, Board of Directors and numerous chairmen of committees during the past year, all of whom entered into their assigned tasks with enthusiasm, thoroughness and a high quality of leadership.

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I SHALL report to you as follows:

Regional Meetings

THIS year we had three regional meetings; the first at New York on April 5th under the committee leadership of Sidney Rolle, Scomet Engineering Co., L. Dwight Granger, Wickwire Spencer Steel Corp., and Major Richard E. Brown, our Executive Secretary. Here a large part of the membership from the New York City area inspected the plant of the U. S. Signal Corps Procurement District at the Army Base in Brooklyn, N. Y. This was followed by the Industrial Preparedness dinner where the Assistant Secretary of War, Colonel Louis A. Johnson, spoke on "The Business of National Defense."

STANLEY P. WATKINS

Manager, Sales Development Rustless Iron and Steel Corporation, Baltimore, Md.

Born in Russellville, Alabama, in 1904, educated in Alabama public schools, Birmingham-Souther College and Carnegie Institute of Technology; Associate Metallurgist at U. S. Naval Laboratory, Munhall, Pennsylvania, 1927 to 1929; Metallurgist Wrought Iron Research Association, Pittsburgh, Pennsylvania, 1930 to 1931; 1931 to present time, Rustless Iron and Steel Corporation, Baltimore Maryland, Metallurgist, Sales Engineer and Manager Sales Development. Member The Wire Association.

✦ ✦ ✦

THE First Regional Meeting of Worcester, Massachusetts, was held on April 25th under chairmanship of Rodman R. Tatnall of Wickwire Spencer Steel Corporation, with an excellent committee of six from the New England territory. Here more than 125 participated in a most interesting program with the presentation of two professional papers, after a plant inspection at the Norton Company. Mayor William A. Bennett of Worcester, a member of the Wire Association, gave official greetings of the city at the dinner.

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ON May 5th the Third Regional Meeting of the Pittsburgh group was held under the chairmanship of A. E. Glenn of the Carboloy Company, assisted by an efficient committee of three. Here we had a most interesting visit to the Westinghouse Electric & Manufacturing Company properties. After the dinner at the Wm. Penn Hotel in the evening three interesting professional papers were presented.

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IT is my sincere hope that these regional meetings of Worcester, New York and Pittsburgh will become annual events in these cities, particularly as Pittsburgh has so firmly established itself.

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MANY thanks to the chairmen and committeemen that have made these regional meetings so successful.

Organization

AT the time of the founding of the Wire Association the perspective of the original directors and founders was of a general nature regarding the wire industry. By progressive thought it was decided to form the ferrous section under a vice-president, at present so excellently lead by John Callaghan of the Steel Company of Canada, and a non-ferrous section under another vice-president, at present E. W. Clark of the General Electric Company.

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IN 1936 a Cold Working section was formed, and its problems have been handled in both the ferrous and non-ferrous sections, whichever classification the problem might have had. At the present time consideration is being given to the formation of a Fine Wire Section, thus giving this association four integral divisions. I heartily indorse the formation of such a Fine Wire Section, and it is hoped that we can bring the idea to a successful conclusion.

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Membership

MANY of us have donated much of our time and energies to the upbuilding of this wire association. To those wheel-horses and spark-plugs that have so enthusiastically given their efforts, herewith are deep words of gratification and appreciation. Two years ago our membership was 302. On October 1st of this year 375 have joined our association—making an increase of 24 percent in that period of time, and I understand that some 15 more have become members at this meeting.

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YOU are to be congratulated on this achievement. Let us hope that you will continue to encourage your friends, in the industry, to join in our Wire Association activities and enjoy the privileges of fraternization of their comrades in-arms of the Wire Industry.

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ONE may have a perplexing problem or a desire to secure additional information, and he can get assistance in his problems from this brotherhood of wire executives, engineers, metallurgists, suppliers of equipment and operating men. May you again be reminded that by increasing membership we will become more powerful and achieve greater importance professionally and technically as an organization.

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Present Economic Conditions

SINCE September 1st, when the world in general was amazed and dumb-founded by the outbreak of hostilities in Europe, practically all phases of industry has become re-vitalized. At present the steel industry is running at 90 percent capacity, with some plants operating at their maximum output with substantial backlogs insuring full operation for the balance of this fourth quarter and with tonnage available for the first quarter of 1940.

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MAY we pause at this point and analyze an economic fallacy in the price structure of this wire industry! By referring to page 216 of Wire & Wire Products of April, 1937, there is recorded my statement made in New York in March, 1937.

FREDERICK A. WESTPHAL
Superintendent of Wire Mills,
Sheffield Steel Corp., Kansas City, Mo.
President, The Wire Association

Born Holyoke, Mass., 1895. Graduate U. S. Naval Academy. Four years with American Steel & Wire Co. In 1922 Assistant Superintendent Rod and Wire Works, Jones & Laughlin Steel Corp., Aliquippa, Pa. In 1928 Superintendent of Wire Mills, Sheffield Steel Corp., Kansas City, Mo. During World War served as Officer Sixth Field Artillery — severely wounded in action — twice cited and decorated for gallantry in action and meritorious services.

In effect I said, "It is public information that the market demands that nails sell cheaper than the wire from which they are made; that barb wire sells cheaper than the galvanized wire from which it is made; that bale ties sell cheaper than the annealed wire from which they are made. Why should wire be punished and sacrificed for being manufactured into finished products? Wire products such as these are used too much as "loss leaders" speaking in terms of cut rate stores, or like the "sugar item" speaking in terms of grocery stores. The Wire Industry uses items, such as these products, too much like a football." Further it was stated "I cannot answer that question and neither can anyone here because the question is too big and vast for us individually. But I do say this, that a bad price condition like this should be given plenty of thought and lots of air."

Gentlemen — two and one-half years have elapsed since this statement was made—let us hope that corrective measures will be taken in the near future to eradicate these economic fallacies, together with kindred others in the industry, and that these problems will be given plenty of thought and lots of air, and lastly—action!

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World Affairs

TWENTY-TWO years ago we sent the American Expeditionary Forces to Europe, as well as a small force to Asia. This resulted in a casualty list of 350,000 killed, missing and wounded. Our Allies hired our money, the repayment of which seems remote. It is the absolute truth that the impetus of force in the field, as well as on the seas, by the Americans in 1918 was unquestionably the deciding factor of victory for the Allies. In spite of the lack of appreciation of the sacrifices made by the United States in the World War by the Allies it should be thoroughly understood that the United States did win World War No. 1.

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MORE than 150 years ago the father of our country, George Washington, advised the policy of forever steering clear of European diplomatic entanglements. In 1823 President Monroe declared the policy of the Monroe Doctrine, that meant a status quo for foreign nations transgressing on the western hemisphere. Today some say George Washington's wisdom is

(Please turn to Page 658)

Continuous Wire Annealing In Open Gas Flames

By Harry W. Smith, Jr.,
American Gas Association,
New York, N. Y.

New apparatus which includes the first continuous wire anneal indicator mechanism and brings new economies and higher speeds. ✦ ✦ ✦ ✦ ✦

ONLY politicians, and perhaps salesmen, can proclaim "new eras", "revolutionary developments", and "astounding strides forward" without a guilty conscience. But during the summer of 1939 we have followed from secretive experiment to industrial full-bloom the development of a new process for the continuous annealing of non-ferrous wire at lightning speeds, which, to stay on the safe side, certainly merits a second look by anyone concerned with non-ferrous metal working or treatment.

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WE refer to the new-principle **open-flame** strand-anneal apparatus devised by **Syncro Machine Company, Rahway, N. J.,** in cooperation with **Surface Combustion Corporation, Toledo, Ohio,**— an ingenious gas-fueled production line which automatically handles wire at paces up to 1500 feet per minute without either furnace or atmosphere-tube—and delivers a uniformly bright-annealed product with a minimum of fuel, labor and equipment.

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BEING totally unconventional in design, proof of the equipment's practicability under actual plant conditions was an important step in its rapid 2-year development. Accordingly, it received its "final examination" in Rahway, N. J., during May and June of this year on a test run of 10 to 20,000 pounds of copper; and performed so handsomely that 28 units have already been sold for "pilot" operation in five well-known wire mills. Nineteen of these are short low-speed lines, with 2-foot annealing burners, feeding bright-annealed wire into continuous enameling equipment at speeds of from 10 to 30 feet per minute. The other nine are of latest design, with longer rows of open gas jets, and are used to continuously bright-anneal, pickle and tin #6 to #36 wire at speeds of from 190 to 1500 feet per minute. In six of these nine cases 27-foot burners are used to allow for maximum wire speeds; in one case a 9-foot burner is designed for; and in the remaining two a 4½ foot burner is ample in view of the small gage wire being run.

✦ ✦ ✦

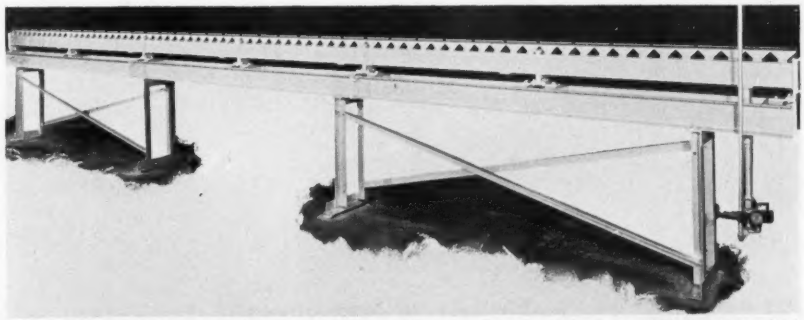

Fig. 1. These gas flames continuously anneal non-ferrous wire at speeds up to 1500 feet per minute without furnace or atmosphere-tube. The wire passes longitudinally through the core of the 27-foot ribbon of flame (the broken white line just above the burner assembly). ✦ ✦ ✦

What A New Unit Can Mean to Wire Industry

BEFORE looking at the new open-flame annealing process in detail, let us consider for a moment what it can mean to the wire industry as its adaptations and acceptance grow. At the moment it seems that its principal usage will be for straight bright-annealing, either on finished wire or between breakdowns. At various speeds, it will fit (as it already has) into anneal-enamel and anneal-pickle-tin combination set-ups —and bring the extra economy of eliminating separate coating lines and the delay, labor, and floor space they involve. It has even been demonstrated that the unit will work on stranded wire.

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AS a straight bright-annealing unit, its chief economies over existing methods of copper and brass annealing result from the fact that there is no furnace to heat up, cool down, or maintain at heat. As a result less fuel is used. Even neglecting this major economy of eliminating heat-up and furnace-maintenance fuel, the consumption of the new type unit **during full operation** averages only ½ cubic foot of manufactured gas per pound of wire annealed. Also, as over and against batch an-

nealing, it is not necessary to heat reels (which is none too good for them), and, if anything does go wrong, only a few feet rather than many tons of wire are spoiled. Metal handling is very much reduced and annealing equipment operation is easier because of the continuous feature of the precess. Long-cycle heating in bulk (often including soaking periods to attain uniform anneals from the core to the surface of large batches) is totally eliminated. Because **open-flame** annealing lines can be started or stopped in an instant without loss of efficiency, they also minimize the finished stock necessary for annealers to carry to cover orders for immediate delivery.

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MOST of the units built so far can handle wire from No. 6 (0.162″) to No. 16 (0.051″) B. & S gage, although smaller units are being made to handle wire down to around No. 36 (0.005″). To date, units with the 9-foot open-flame-anneal burner are capable of speeds up to 225 feet per minute on No. 14 strand. The 27-foot burner models can triple that speed. On the smallest sizes of wire it has been shown that, with 4½-foot burners, velocities up to 1500 feet per minute can be reached before special spooling problems are encountered.

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The Principle of Open-Flame Annealing

ESSENTIALLY, the apparatus consists of a long row (2′ to 27′) of extremely accurately controlled gas flames, with positioning dies spaced along the length of the row so that the wire passes through just that portion of each flame in which combustion has advanced exactly to the point where both temperatures and burning gas compositions are "just right" for the anneal. Each flame is a stubby ribbon of fire 4½″ long and as thick as the slot (0.030″ to 0.060″) through which mixed gas and air pass into the combustion zone. The flames are end-to-end as shown in Figure 1 to form the compound burner length. In the photograph the horizontal white bars spaced end-to-end above the compound burner body are actual photo-images of the flames (obtained by double exposure after the burner system had been photographed and the room darkened). Adjustment of the anneal is provided either by the height and character of the flames or by the speed of the wire as it races along its flaming route. The entire burner assembly is enclosed in a sheet metal housing equipped with flue and side doors, Figure 2, to prevent factory drafts from disturbing the exactly regulated flame position.

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BURNERS are fed with premixed gas and air delivered under positive pressure from one of the many types of automatic gas-air proportioning devices now on the market, and adjustment of the ratio of air to gas is very nearly that theoretically required for complete combustion. A compound annealing burner 9′ long will consume about 80 cu. ft. of manufactured gas per hour.

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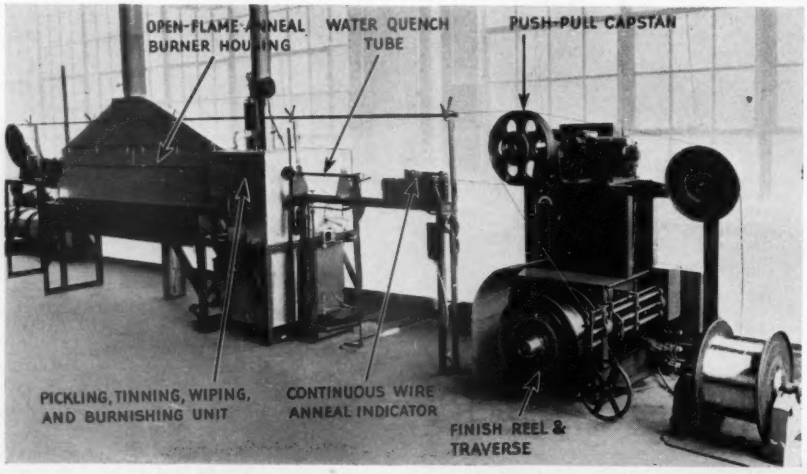

Fig 2. A complete open-flame bright-anneal-pickle-tin line of the new Syncro type designed to handle #14 wire at 225 feet per minute—showing the various elements in the amazing new equipment. ✦

A Representative Line, Step by Step

IT is worth while to trace in Figure 2 the complete cycle of wire flow from supply reel to finish reel, inasmuch as almost every element of the apparatus involves newly patented, ingenious features developed by those veterans at Syncro Machine Company who have been so successfully building wire-making equipment for the non-ferrous metal industry for nine years. From the supply reel, wire passes over an idler pulley to the push-pull capstan, which it loops once for positive input speed control. This same capstan carries the delivery sheave, and this sheave is slightly larger in diameter than the feed sheave so that the wire in the entire anneal-pickle-tin line at any instant is always under a positive tension equivalent to one-half of one per cent elongation. From the delivery sheave of the push-pull capstan, the wire passes on to a traverse—and-idler-pulley combination which feeds it to the finish reel. At this point, it is worth noting that the traverse-idler-pulley combination shown in Figure 2 is of the older type, the modern type being so designed that the pulley rotates around the traverse bars to minimize any eccentric load upon the traverse mechanism.

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FROM the feed sheave on the push-pull capstan, the wire travels through an elevated feed tube to the idler pulley at the other end of the line, whence it is directed through a wire brush cleaner (Figure 3) consisting of cylindrical brushes (above and below the wire) rotating in directions counter to the wire flow and oscillating back and forth along their axis of ro-

tation. From this cleaner the wire passes between the two steel rolls of a motor-driven feeder—an element which is disengaged from the line except at the beginning of a run when it performs its duty of driving the wire through the anneal — pickle — tin line into position to be hand-threaded over the capstan, through the traverse, and onto the finish reel.

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THE cleaned wire passes through the annealing flames as previously described, its exact position within the cross-section of the air-gas flame being insured by cast iron die holes every 4½". Obviously, wire travelling at 225 feet per minute through the core of a 9-foot ribbon of flame would be in the annealing heat zone 2.4 seconds.

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FROM the annealing burners wire may go directly through the water-quench tube and emerge beautifully bright-annealed, or, as in Figure 2, it may flow through special continuous pickling, tinning, wiping and burnishing devices before being quenched, dried and spooled as coated material. In either event, carefully machined "restrictions" at either end of the water - cooled quenching tube are fitted with suction off-takes to prevent any water from leaking out of the ends of the tube. From this point on, the wire dries rapidly by its own heat, or by compressed air jets if required.

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The First Continuous Wire Anneal Indicator

JUST beyond the quenching tube is an amazing device developed by Syncro to provide a constant visual indication of the anneal — a unit which may be used as an automatic control of either wire speed or flame height to hold the anneal constantly at the desired point. This device, shown in Figure 4, is, insofar as can be determined, the first element made available for continuously indicating degrees of anneal as wire passes through it at production rates. It consists of two fixed wheels, A and B, over which the wire passes, and between which it is depressed by the floating wheel, C. The wheel, C, rides in a ball bearing (as frictionless as possible) which in turn rides on longitudinal rods located behind the scale bar as in Figure 4. As a result it has a tendency to move forward from its normal mid-position between A and B with the forward motion of the wire. The degree to which it floats forward is an inverse index of the hardness, or "springiness", of the wire, and, hence, a measure of the resultant anneal. In Figure 4, position 1 would be assumed by the floating wheel if the wire were one hundred per cent hard or "springy", whereas position II would be assumed if the wire were extremely soft. Points between these two locations can be calibrated against actual elongation tests to furnish the anneal indication at a given wire speed and tension. It is possible to arrange the floating wheel to actuate the movable contact of a Wheatstone Bridge or to interrupt beams, directed at photo-electric cells, and, thus, automatically control either wire speed or flame characteristics according to the anneal desired.

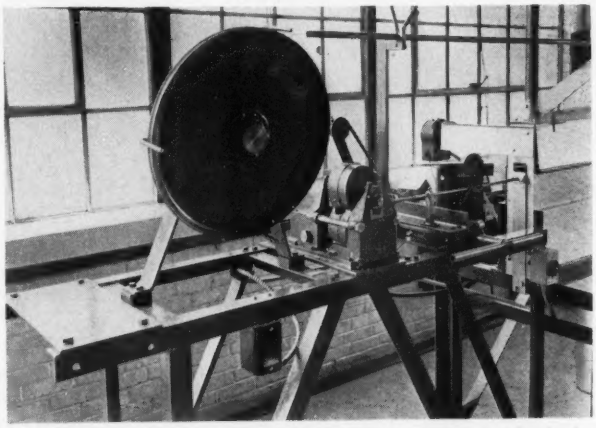

Fig. 3. Before the wire encounters the open-flame gas jets which do the bright-annealing, it is cleaned by counter-rotation wire brushes, and passes between feeding rolls disengaged after threading is complete. ✦

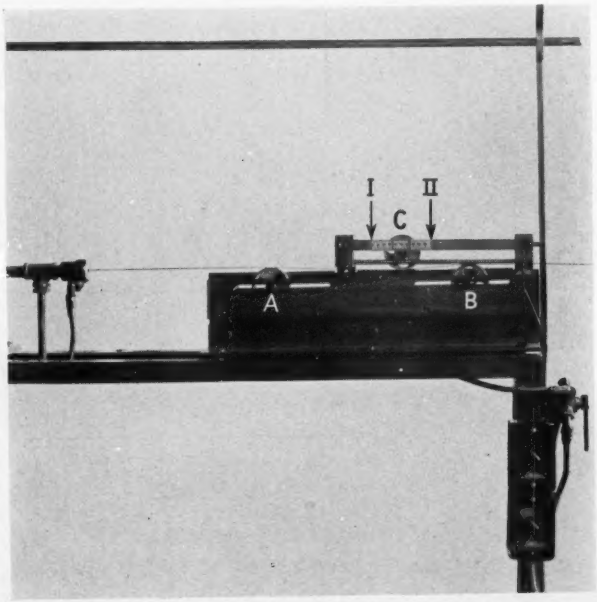

Fig. 4. The first unit for continuously indicating wire anneals as wire streaks through it at production rates. The upper wheel position indicates the anneal for a given type, composition, speed, and tension of wire.

✦ ✦ ✦

Even Pickling and Tinning In Continuous Anneal Line

SO far in this discussion, we have confined ourselves to the bright annealing features of the new equipment. However, the pickling and tinning apparatus is equally ingenious and worthy of attention. For the continuous pickle, wire passes through a cell of Pyrex glass into which are injected dry chorine gas and other vapors at a temperature of 500°F, which even at such breakneck speeds effect a very efficacious cleaning and fluxing. Thence the wire passes through a special cast iron channel or bore into the side of which molten tin at 500°F is pumped under low pres-

(*Please turn to Page 662*)

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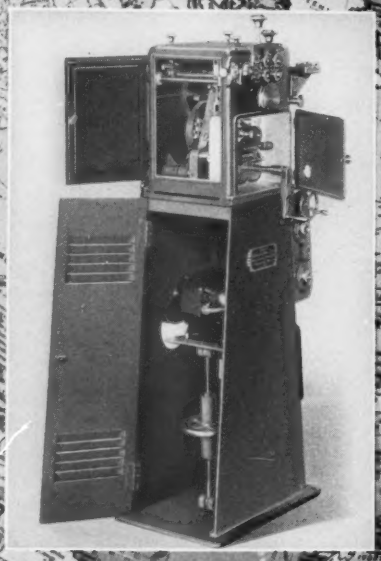

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Worcester, Massachusetts, U. S. A.

"Back-Pull" Patent Issued

In view of the past discussions on the subject of "back-pull," the granting of a patent for the Smith-Stringfellow Process for strip mills will be of interest. The claims allowed are now disclosed. ✦ ✦ ✦ ✦ ✦

Allowed Claims on Smith-Stringfellow Strip Mill United States Patent

A STRIP mill comprising a roll stand provided with reducing rolls, strip reels to which opposite ends of a strip extending between the reducing rolls are attached, a motor geared to each reel, each motor being adapted to drive its reel to wind the strip thereon and to be driven by its reel while the strip is unwinding therefrom, each motor having a field winding through which torque is applied which tends to rotate the motor shaft in a direction to wind the strip on its reel, a controlling element movable in response to a variation in the tension of the strip on either side of the roll stand and means operated by said controlling element for controlling the motor torque ratio.

✦ ✦ ✦

A STRIP mill comprising a roll stand provided with reducing rolls, strip reels to which opposite ends of a strip extending between the reducing rolls are attached, a motor geared to each reel, each motor being adapted to drive its reel to wind the strip thereon and to be driven by its reel while the strip is unwinding therefrom, each motor having a field winding through which torque is applied which tends to rotate the motor shaft in a direction to wind the strip on its reel, means for measuring the ratio of the strip tensions on opposite sides of the roll stand, and means controlled by said measuring means for controlling the motor torque ratio.

✦ ✦ ✦

A STRIP mill comprising a roll stand, strip pulling means at one side of the roll stand, strip retarding means at the opposite side of the stand, means for measuring the ratio of the strip tensions on opposite sides of the roll stand, and means operated by said measuring means for controlling said strip retarding means.

✦ ✦ ✦

A STRIP mill comprising a roll stand, strip pulling means at one side of the roll stand, strip retarding means at the opposite side of the stand, a movable frame having strip guiding rollers on opposite sides of the roll stand, and fixed rollers spaced outwardly of said guiding rollers and positioned to deflect the strip outwardly of the guide rollers at an angle to the portion of the strip between said rollers, so that a thrust varying with the tension in the strip is exerted upon each of the guide rollers and the position of the frame is dependent upon the ratio of the tensions in the strip on opposite sides of the roll stand.

✦ ✦ ✦

A STRIP mill comprising a roll stand, strip pulling means at one side of the roll stand, strip retarding means at the opposite side of the stand, a pair of movable mounted strip guiding rollers mounted one on each side of the roll stand and connected for movement in unison, fixed guide rollers positioned to deflect the strip outwardly of the guide rollers at an angle to the portion of the strip between said rollers, so that variations in the ratio of strip tensions on opposite sides of the roll stand causes the guide rollers to be shifted, and means controlled by movements of said guide rollers for varying the tension in a portion of the strip.

✦ ✦ ✦

IN a strip mill, a roll stand, strip reels on opposite sides of said stand, motors having driving connections with the reels, each motor adapted to alternately drive its reel and be driven by its reel, means responsive to variations in strip tension occurring on either side of the roll stand for controlling one of said motors to vary the torque thereof, and means controlled by one of said reels and responsive to changes in the diameter of said reel for controlling one of said motors to vary the torque thereof.

✦ ✦ ✦

IN a strip mill, a roll stand, strip reels on opposite sides of said stand, motors having driving connections with the reels, each motor adapted to alternately drive its reel and be driven by its reel, means responsive to changes in the diameter of the unwinding reel for controlling the motor of said reel to vary the torque thereof, and means responsive to changes in the ratio of the strip tensions on opposite sides of the roll stand for controlling the motor of the unwinding reel to vary the torque thereof.

✦ ✦ ✦

IN a strip mill, a roll stand, strip reels on opposite sides of said stand, motors having driving connections with the reels, each motor adapted to alternately drive its reel and be driven by its reel, means responsive to changes in the diameter of the unwinding reel for

controlling the motor of said reel, means responsive to changes in the ratio of the strip tensions on opposite sides of the roll stand for controlling the motor of the unwinding reel, and means responsive to changes in the diameter of the unwinding reel for modifying the action of the tension responsive means.

✦ ✦ ✦

IN a strip mill, a roll stand, strip reels on opposite sides of said stand, a motor for retarding the unwinding reel, a motor for driving the wind-up reel, means for varying the torque of the retarding motor proportionally to changes in the diameter of the unwinding reel, and means for increasing or decreasing the torque of the retarding motor as the tension of the strip between the rolls and wind-up reel increases or decreases.

✦ ✦ ✦

IN a machine for reducing the cross-sectional area of elongated metal bodies, means for applying lateral pressure to said body, means forwardly of the pressure applying means for applying a forward pull to said body, means for applying a backward pull to said body rearwardly of the pressure applying means, a tension ratio measuring device engaging with said body ahead of and to the rear of said pressure applying means, and means controlled by said measuring device for increasing or decreasing the backward pull to maintain a substantially fixed ratio between the forward and backward pulls.

✦ ✦ ✦

IN a machine for reducing the cross-sectional area of elongated metal bodies, means for applying lateral pressure to said body, means forwardly of the pressure applying means for applying a forward pull to said body, means for applying a backward pull to said body rearwardly of the pressure applying means, fixed roller guides for said body spaced forwardly and rearwardly of said pressure applying means, a movable frame having a roller engaging the elongated body between each of the fixed guides and the pressure applying means and positioned to maintain bends in said body between the fixed rollers and movable frame rollers, and means connected to said movable frame for controlling the ratio between the forward and backward pulls exerted on the body.

✦ ✦ ✦

IN a reversing strip mill, a roll stand, strip reels mounted on opposite sides of said stand, an electric motor of each reel, each motor having windings and connections by which it may be operated as a substantially constant horsepower pulling motor and windings and connections by which its characteristics may be altered to adapt it for dynamic braking, means associated with each motor for varying the torque thereof while braking, and means operated by the strip and responsive to variations in the ratio of strip tensions on opposite sides of the roll stand for controlling said torque varying means to maintain a back pull on the strip which bears a substantially fixed ratio to the forward pull.

✦ ✦ ✦

IN a reversing strip mill, a roll stand, strip reels mounted on opposite sides of said stand, an electric motor for each reel, each motor having windings and connections by which it may be operated as a substantially constant horsepower pulling motor and windings and connections by which its characteristics may be altered to adapt it for dynamic braking, means associated with each motor for varying the torque thereof while braking, means for measuring changes in the effective diameter of the unwinding reel and for controlling said torque varying means, and means for measuring the ratio of the tensions in the strip on opposite sides of the roll stand and for controlling said torque varying means.

✦ ✦ ✦

IN a reversing strip mill, a roll stand, strip reels mounted on opposite sides of said stand, an electric motor for each reel, each motor having windings and connections by which it may be operated as a substantially constant horsepower pulling motor and windings and connections by which its characteristics may be altered to adapt it for dynamic braking, means associated with each motor for varying the torque thereof while braking, means for measuring changes in the effective diameter of the unwinding reel and for controlling said torque varying means, means for measuring the ratio of the tensions in the strip on opposite sides of the roll stand and for controlling said torque varying means, and means operated by the reel diameter measuring means for modifying the action of the tension ratio measuring means.

✦ ✦ ✦

A STRIP mill comprising a roll stand provided with reducing rolls, strip reels to which opposite ends of a strip extending between the reducing rolls are attached, a motor geared to each reel, each motor being adapted to drive its reel to wind the strip thereon and to be driven by its reel while the strip is unwinding therefrom, means responsive to variations in the ratio of the strip tensions on opposite sides of said rolls for varying the torque of one of said motors to maintain a substantially constant ratio between said strip tensions, and means responsive to variations in the effective diameter of one of said reels for modifying the action of said torque varying means.

✦ ✦ ✦

A STRIP mill comprising a roll stand provided with reducing rolls, strip reels to which opposite ends of a strip extending between the reducing rolls are attached, a motor geared to each reel, each motor being adapted to drive its reel to wind the strip thereon and to be driven by its reel while the strip is unwinding therefrom, means responsive to variations in the ratio of the strip tensions on opposite sides of said rolls for varying the torque of the unwinding reel motor to maintain a substantially constant ratio between

(*Please turn to Page 666*)

Fatigue Tests of Wire

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and

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In many applications the serviceable life of wire is terminated by fatigue failure. Testing machines necessitating a machined specimen do not give a true index of the endurance properties of wire because the effect of surface conditions are removed. ✦ ✦ ✦ In this paper a method is presented for testing straight wire with the original surface intact and correlation of results, using a bridge wire and a low-carbon steel, are obtained on a second type of testing machine. The two types of wire testing machines are described, also the machine for testing machined specimens. ✦ ✦ Results on a low-carbon steel rod and on a brass rod indicate that a tensile set of 0.10 per cent, sufficient to straighten some coiled wire, does not appreciably influence the endurance limit. ✦ ✦ ✦ ✦ ✦ ✦ ✦

SURFACE conditions may appreciably affect the fatigue strength of any structural or machine member. However, the influence of surface finish on the fatigue strength is not determined in the ordinary type of fatigue testing machine in which stress concentration at the grips makes it necessary to use a specimen having a reduced critical section in the length of the specimen where fracture is made to occur; this critical zone would accordingly not include the original surface of the specimen.

✦ ✦ ✦

WIRE represents a structural material used commercially with an unprepared surface and whose serviceable life is in many instances limited by fatigue. Consequently there is a distinct need in the materials testing field for an inexpensive method of testing materials such as wire and rod with a surface condition such as will exist on the member when used in service; this will be referred to as the "as received" condition.

✦ ✦ ✦

THE Krouse rotating-strut machine, embodying the same principles of load application as the Haigh-Robertson wire testing machine, developed in England, was used in the tests described in this paper. By applying an end thrust to a rotating wire, the specimen is bent into the form of a column in which the maximum stress occurs on the original surface of the wire at the mid-section; hence, the stress concentration at the grips of the machine does not influence the test results.

✦ ✦ ✦

THE purposes of this investigation were to determine the effect of straightening wire specimens preparatory to testing in the rotating-strut machine; to show the effect of surface conditions upon the fatigue strength of two commercially finished materials; and to check the reliability of the rotating-strut machine by comparing the results obtained with results from another type of fatigue testing machine, using identical materials. Three types of machines were used: (1) the rotating-strut machine, (2) a vibratory (constant-strain) machine, and (3) a high-speed rotating-cantilever-beam machine.

✦ ✦ ✦

Description of the Rotating-Strut Machine

IN the rotating-strut machine, Fig. 1, the specimen is loaded as a free-ended column in which the bending stresses are greatest at the point of maximum deflection, the center of the length.

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ONE end of the specimen is gripped in chuck *C* which is directly connected to the motor shaft. The other end of the specimen is held by a sleeve in spherical thrust load bearing *B*, carried by the loading screw *P*. The bearing block *D*, containing the load bearing and the loading screw, may be fixed in any position along the swinging arm *A*, depending upon the specimen length. The swinging arm is pivoted on a vertical axis directly above the face of driving chuck *C* and is counterbalanced by the movable weight *W*.

✦ ✦ ✦

THE specimen is loaded by screwing the load bearing towards the driving chuck. The compressive load causes the specimen to buckle and to swing the arm carrying the load bearing through an angle equal to the angle of deflection of the end of the specimen. The chord of

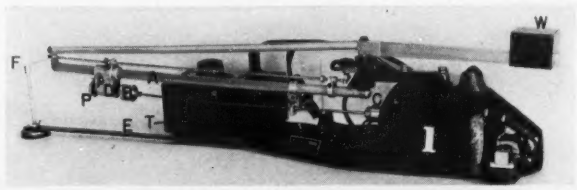

Fig. 1. Rotating-Strut Machine. ✦ ✦ ✦ ✦

A paper presented at the annual meeting of the American Society for Testing Materials—June, 1939. Published by permission of A.S.T.M.

the angle through which the arm swings is measured on the scale F, which is fixed relative to the main frame of the machine by arm E.

✦ ✦ ✦

THE deflected specimen is caused to rotate about its axis of flexure by a series-wound variable speed a. c. motor, which has a speed range of 2000 to 12,000 r.p.m. Speed control, which is necessary to avoid the critical vibration speeds of the test specimen, is obtained by varying the voltage supplied by the autotransformer T. A revolution counter and an automatic stop are attached to the machine.

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Stress Calculation

THE value of maximum stress in the specimen used in the rotating-strut machine is obtained by considering the specimen to be a long column for which the Euler column formula may be used. This formula assumes a sinusodial flexural curve for the specimen with zero bending moment at the ends. The maximum stress occurs at the center of the specimen and is calculated from the equation

$$\theta = 360\ S\ L/\pi^2\ E\ d$$

where θ = the angle, in degrees, between the axis of the unstressed specimen and a line between the load point and the chuck face of the stressed specimen,

S = the maximum unit stress in the specimen at the center of the span length, in pounds per square inch,

L = the active length of the specimen between pivots, in inches,

d = the diameter of the test specimen in inches, and

E = the modulus of elasticity, in pounds per square inch.

✦ ✦ ✦

FOR computations of θ the chord of the angle is read on the scale to 1/64 in.; making θ accurate to 2 min. of a degree. In the derivation of the formula, θ is substituted for tan. θ. At a stress of 58,000 psi. θ is 7 deg, and 17 min. The substitution gives a stress value low by 0.54 per cent. In addition a small compressive stress acts on the specimen. Although negligible, the error tends to balance the error involving tan. θ.

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Description of the Vibratory (Constant-Strain) Machine

THE machine shown in Fig. 2 is used to give completely reversed bending in one plane to wire specimens in which the maximum stress occurs on the original surface of the material.

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THE specimen is fastened rigidly to the calibrated spring M, and the load is applied through the free end of the specimen by the connecting rod R, actuated by the variable-throw crank C. Dial gage D measures the deflection of the calibrated spring from which the load applied perpendicular to the longitudinal axis of the specimen at the load line may be obtained. The significant bending moment on the specimen is calculated from the load and the distance of the critical section from point of application of the load.

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THE load on the specimen is varied by changing the throw on the crank C. The range of stress is varied by moving the casting holding the crank and crankshaft in relation to the frame holding the spring. This movement is controlled by two setscrews. A completely reversed cycle of stress was used in the tests described in this paper.

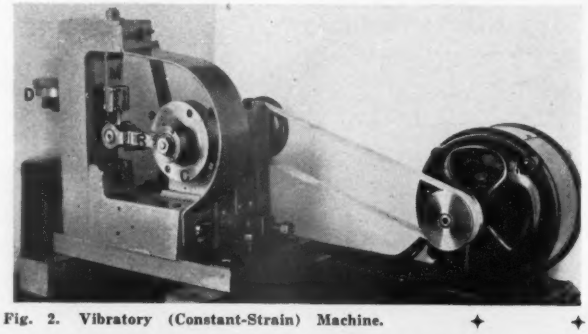

Fig. 2. Vibratory (Constant-Strain) Machine.

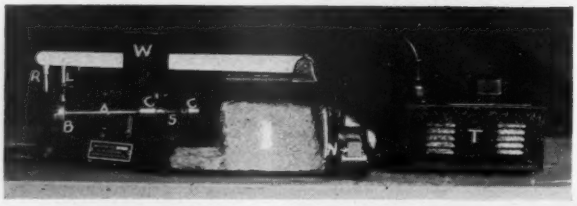

Fig. 3. High-Speed Rotating-Cantilever-Beam Machine.

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Description of the High-Speed Rotating-Cantilever-Beam Machine

THE high-speed rotating-cantilever-beam machine (Fig. 3) is the wire machine with the wire testing adapters and arms replaced by an arm A carrying a chuck C' at one end and a bearing B at the outer end. The scale beam, graduated in inch-pounds of bending moment on the specimen S and carrying the weight W, is pivoted at one end on top of the motor housing. Load is applied to bearing B by the rubber tipped leg L. Rod R operates the automatic stop in the base of the machine.

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Materials and Test Specimens

THE materials used in the various fatigue tests are as follows: S.A.E. No. 1020, 1/8-in. diameter cold-drawn steel rod; S.A.E. No. 1020, 3/16-in. diameter cold-drawn steel rod; cold-drawn 80-20 brass rod, 1/8-in. diameter; and high-carbon steel wire, heat treated and galvanized, 0.195 in. in diameter.

✦ ✦ ✦

FOR the rotating-strut machine, the specimens were approximately 100 diameters in length, the ratio of length to radius of gyration (L/r) for all tests was over 400, well within the range of applicability of Euler's column formula. Adapters, 1/4 in. in outside diameter to fit the machine grips, were pressed onto the ends of each specimen.

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IN order to compare the results obtained on the rotating-strut machine and those obtained on the vibratory machine, it was

necessary to have the maximum stress in the vibratory machine specimens occur on the original surface of the material at a section outside the stress-raising influence of the machine grips. To accomplish this condition, the wire test specimens were reduced in width to 0.050 in. at a section in the length between the grips so as to have a minimum cross-section nearly rectangular in shape, the shorter sides of this section being arcs of the original surface material. The specimens were placed in the grips of the machine in such a manner that the maximum bending stress occurred on the original surface. The maximum stress on the specimen is calculated from the flexure formula, assuming the minimum section to be rectangular—the error introduced by this assumption is very small.

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A HIGH-SPEED rotating-beam machine was used to obtain the endurance limits on machined and polished specimens of the S.A.E. No. 1020, 3/16-in. diameter steel rod and of the heat-treated steel wire. Specimens for this machine, 2 in. in length, were turned by a tool swung on a 1½-in. radius to a minimum diameter at the center of 0.10 in. The surface of these specimens was carefully polished to remove all circumferential scratches.

✦ ✦ ✦

Test Methods

TENSION tests were made on all materials to obtain values of tensile strength, yield strength corresponding to 0.10 per-cent offset[4], and modulus of elasticity. Table I gives these data.

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THE following fatigue tests were made:

Series 1.—Tests on the ⅛-in. diameter brass and the ⅛-in. diameter S.A.E. No. 1020 steel rod to determine the effect on the fatigue strength of giving the materials a permanent tensile deformation of 0.10 per cent. The endurance limits were obtained first on specimens cut from the original rods and then on similar specimens that had been given a 0.10 per cent tensile permanent deformation or set. A tensile set of 0.10 per cent is sufficient to straighten wire or rod which is initially curved.

✦ ✦ ✦

Series 2. — The high-carbon heat-treated steel wire and the S.A.E. No. 1020, 3/16-in. diameter steel rod were used in this series of tests to determine the effect of surface conditions upon the fatigue strengths of the materials. The high-carbon steel wire, which was taken from a coil and hence had some curvature, was straightened by tensile loading to the stress which caused the material to retain a permanent deformation of 0.10 per cent. Specimens of the S.A.E. No. 1020 steel rod were made from the material as received. The fatigue strengths of both materials were established in the rotating-strut machine with the original surface of the specimen intact; the fatigue strengths were also found for specimens with turned and polished surfaces by means of the rotating-beam machine.

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Series 3 — In order to compare fatigue strengths obtained on the different machines, tests were made in the vibratory type machine using the same materials as were used in series 2. As already noted, in this machine, the maximum stress occurred on the original surface of the materials, and hence the results of fatigue strengths might be expected to be comparable with those found in the rotating-strut machine.

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Test Results

THE curves of Figs. 4 and 5 show the results obtained in the various tests, a summary is given in Table II. It is evident that the straightening of the S.A.E. No. 1020 steel rod and the 80-20 brass rod had no pronounced effect upon the fatigue strengths of the materials. The endurance limit of the S.A.E. No. 1020 steel rod as received, Fig. 4, was 53,000

TABLE I.—RESULTS OF STATIC TENSION TESTS.

	Tensile Strength, psi.	Yield Strength, psi.	Elongation in 10 in., per cent	Reduction of Area, per cent	Modulus of Elasticity, psi.[a]
S. A. E. No. 1020, 3/16-in., cold drawn	101 000	91 000	15.5	44	30 000 000
S. A. E. No. 1020, ⅛-in., cold drawn	116 000	108 000	11.0	39	30 000 000
Bridge wire[b]	223 000	189 800	6.1[c]	37	29 400 000
Brass Rod, ⅛-in., cold drawn	72 000	52 000	7.2	51	13 000 000

[a] Average values.
[b] Swanger and Wohlgemuth, "Broken Loops", Metal Progress, Vol. 30, August, 1936, pp. 59-67.
[c] 2-in. gage length.

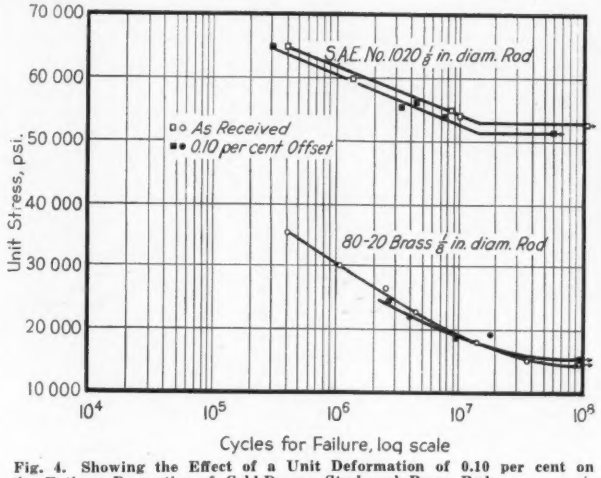

Fig. 4. Showing the Effect of a Unit Deformation of 0.10 per cent on the Fatigue Properties of Cold-Drawn Steel and Brass Rods. ✦

psi. while that of the same material which had been given a 0.10 per cent tension elongation was 52,000 psi. This difference is no greater than the probable experimental error. The endurance limits of the brass rod in the as received condition was 15,000 psi. and after being given a tensile set of 0.10 per cent was 16,000 psi.

✦ ✦ ✦

IT may be concluded from the results obtained in the above series of tests that the small amount of tensile elongation had no measurable effect upon the fatigue strength of the materials. The results listed here have a limited application, and more extensive research will be required to determine definitely what effect straightening has on high elastic strength materials.

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THE effect of surface condition upon the fatigue strengths of the heat-treated high-carbon steel wire and the S.A.E. No. 1020, 3/16-in. rod are shown by the curves of Fig. 5. The fatigue strength of the heat-treated wire as tested in the rotating - beam machine, using carefully machined and polished specimens, was 132,000 psi. The same wire tested in the rotating-strut machine with the original galvanized surface intact had an endurance limit of 58,000 psi. In calculating the stress on the galvanized specimens, the protective coating was considered as having zero thickness, that is, the specimen diameter was taken as the diameter of the wire with the zinc coating removed. Taking the value of the endurance limit obtained on polished specimens in the rotating-beam machine as a basis, there was a 56 per cent decrease in fatigue strength due to the surface defects of the material.

THE photomicrograph of Fig. 6 clearly shows a deep pit and slight surface decarburization in the material. The low value for fatigue strength obtained is not unusual considering the stress concentration due to pits and the weakening effect of the ferrite grains. From Fig 6 it will be noted that the decarburization follows the surface pit and extends into the parent metal of the wire, a condition very poor from the fatigue standpoint. The dark band next to the parent metal, probably represents a hard and brittle zinc-iron compound often found in hot-dipped galvanized steel. This hard material, weak in fatigue, is situated in the region of maximum stress, and a crack forming there progresses into the soft grains which have a low resistance to the spread of a crack. Further progress of the fracture leads to fatigue failure, since the heat-treated parent metal has a rather high degree of notch sensitivity, or a low resistance to the propagation of a crack. The combination of sharp surface discontinuities, a galvanized surface, surface decarburization, and a notch sensitive material are adequate explanation for the low endurance limit of the high-carbon heat-treated steel wire.

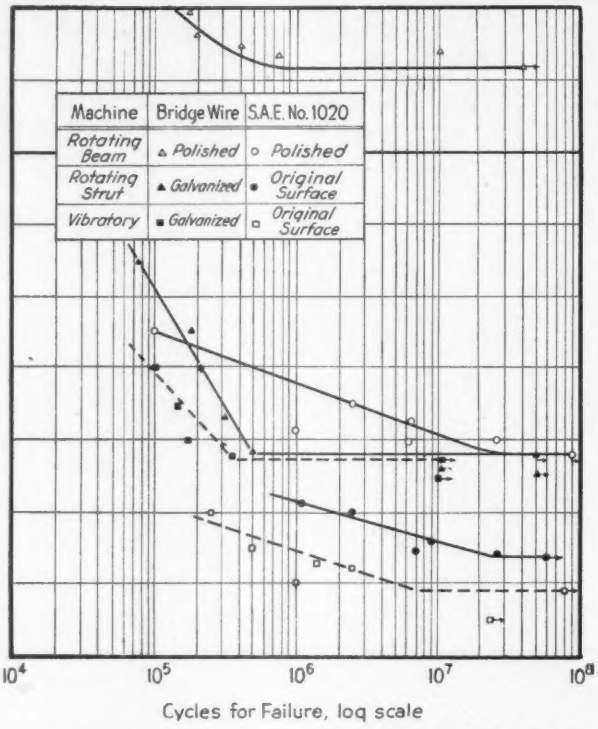

Fig. 5. Showing the Effect of Surface Condition on the Fatigue Properties of a High-Carbon Steel Wire and a S.A.E. 1020 Cold-Drawn Rod.

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THE weakening effect of surface defects is again shown by the results obtained in tests of the S.A.E. No. 1020, 3/16-in. steel rod. The fatigue strength as determined in the rotating-strut machine was 43,000 psi. as compared to 58,000 psi. for the polished specimens tested in the rotating-beam machine. These figures represent a decrease in fatigue strength of 26 per cent due to surface condition. The cold-drawn rod presents a very much better surface from the fatigue standpoint than does the galvanized wire, since the test results for this rod show much less reduction in the endurance limit due to the

TABLE II.—RESULTS OF REPEATED-STRESS (FATIGUE) TESTS.

	Diameter, in.	Surface Condition	Endurance Limit, psi.	Testing Machine
Bridge wire ..	0.195	Galvanized[a]	58 000	Rotating strut
		Galvanized[a]	57 000	Vibratory
		Machined	132 000	Rotating beam
S.A.E. No. 1020	3/16	Cold-drawn	43 000	Rotating strut
		Cold-drawn	38 000	Vibratory
		Machined	58 000	Rotating beam
S.A.E. No. 1020	1/8	Cold-drawn	53 000	Rotating strut
		Cold-drawn[a]	52 000	Rotating strut
Brass	1/8	Cold-drawn	15 000	Rotating strut
		Cold-drawn[a]	16 000	Rotating strut

[a] Material given a tensile set of 0.10 per cent.

surface condition than was found for the heat-treated high-carbon galvanized wire. The photomicrographs of the cold-drawn rod, which are not shown, indicated a normal structure with no pronounced surface discontinuities or decarburization.

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THE results of the above tests are in agreement with work done on similar materials at the National Bureau of Standards by Shelton and Swanger[5]. One of the materials they used was identically the same high-carbon heat-treated galvanized steel wire that was used in the tests herein reported.

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REFERRING to the curves of Fig 5, it can be seen that a close agreement of results was obtained by testing the high-carbon steel wire and the S.A.E. No. 1020 rod in the rotating-strut machine and in the vibratory type machine. The fatigue strength for the high-carbon wire is nearly the same as determined in the two machines. The fatigue limit of the cold-drawn rod was 5000 psi. lower as found from tests in the vibratory type machine. This decrease in fatigue strength may possibly be attributed to stress concentration at the sharp corners of the specimens. The high-carbon wire specimens were polished and the corners rounded off, but since this made it difficult to determine the thickness, the specimens from the cold-drawn rod were used with sides and sharp edges of the machined surfaces unpolished. In dealing with the bending of a rectangular beam, the corner is usually not considered as a stress raiser, but at a sharp, or rough corner there is a stress concentration which does affect the fatigue results.

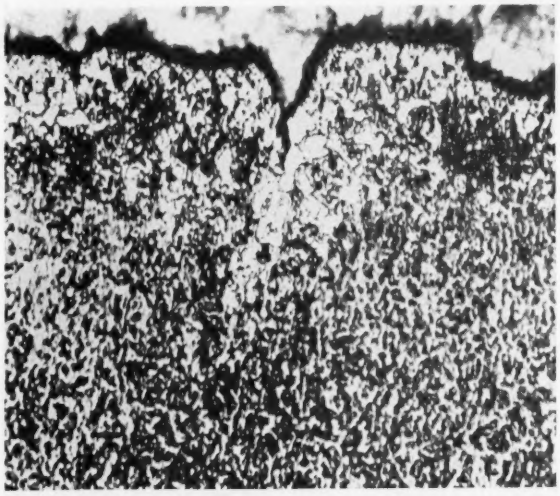

Fig. 6. Photomicrograph of Galvanized Heat-Treated Bridge Wire Showing Surface Decarburization and a Surface Discontinuity. (Trans. X500 nital)

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Summary

1. The rotating-strut machine offers a convenient and relatively inexpensive means of testing wire or rod in diameters from $\frac{1}{4}$ to $\frac{3}{16}$ in. without removing the original surface of the wire or rod. The comparable results obtained on the rotating-strut machine and the vibratory type machine indicate that the methods of load application and stress calculation used for the rotating-strut machine are reliable.

2. The surface condition of the wire tested had a pronounced influence in reducing the fatigue strength below that found by testing specimens which had a carefully machined and polished surface.

3. Straightening of the brass and soft steel rod by giving the rod a permanent elongation of 0.10 per cent had no appreciable effect upon the fatigue strength of the materials and showed that these materials can be straightened for test in the rotating-strut machine without measurably influencing the results obtained.

✦ ✦ ✦

Acknowledgment

The investigation described in this paper was a part of a thesis carried out by the first named author under the direction of N. J. Alleman. During the progress of the work the authors received valuable suggestions and criticism from Profs. H. F. Moore and F. B. Seely.

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[4]Standard Methods of Tension Testing of Metallic Materials (E8 - 36), 1936 Book of A.S.T.M. Standards, Part I, p. 833.

[5]S. M. Shelton and W. H. Swanger, "Fatigue Properties of Steel Wire," Journal of Research, Nat. Bureau Standards, Vol. 14, January, 1935, pp. 17-32.

E. T. Gill and R. Goodacre, "Some Aspects of the Fatigue Properties of Patented Steel Wire," Carnegie Scholarship Memoirs, Iron and Steel Inst. (London) (1936).

The Discussions at The Wire Association Meetings
Will Be Published in Detail in the January, 1940
Issue of Wire and Wire Products.

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Recent Trends In The Further Uses of Nickel Alloys

The use of nickel alloy steels constantly broadened during 1939, and there are certain outstanding developments that indicate directions of further usefulness and justify the forecast of continued expansion and increased tonnages.

Wrought Steels

WITH production facilities now available to assure ample supplies of a wide range of shapes and sizes and with details of distribution satisfactorily worked out, the use of the corrosion resistant steels of the nickel-copper type continues to expand rapidly. An increasing number of mills are marketing these steels, usually as proprietary products, and with local stocks available to all important industrial centers they are being widely adopted for structural members of power shovels, road scrapers, rail cars, freight cars, tank cars, tank trucks, trailers, skips and similar applications where their high strength/weight ratio makes possible appreciable savings in deadweight.

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A STEEL containing 3½% of nickel and susceptible to nitriding, and developing under this treatment a tough case, capable of withstanding higher unit pressures without spalling than other nitrided steels, has proved definitely superior for such applications as plug gauges, as well as knuckle pins for radial aircraft engines. One important factor in the improved performance of the nickel containing composition is its ability to precipitation harden at the temperatures at which nitriding is carried out, thus assuring a stronger supporting core. This faculty of precipitation hardening at relatively low temperatures is leading to its consideration for parts where the distortions of high temperature heat treatment are most difficult to control. The advantage of flame hardening is being used in wrought and cast nickel steels where high strength and hardness are necessary and where the size makes impracticable conventional methods of heat treatment. Large gears, such as are used in mining machinery, oil drilling equipment, paper mills and steel mills are an example of this use.

✦ ✦ ✦

THE nickel-chromium and nickel-molybdenum steels when suitably oil hardened, develop, in the plastic range, high yield strengths with good ductility and toughness. This unusual combination of properties which, under excessive load permits of slight deformation before breaking, has led to their widespread adoption for shovels and a great variety of hand tools. In the higher carbon ranges steels of this type show great promise for plow-shares, discs and other agricultural equipment parts. In some applications for the paper and petroleum industries, requiring corrosion resistance, tubing made from the low carbon alloys with 5% nickel is proving useful.

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Nickel Cast Irons

CONSISTENCY in the high mechanical properties, the greater toughness and the controllable hardness which are offered by nickel cast irons has taken the place of the novelty surrounding the earlier mention of these properties. There has, however, been marked progress in bringing together the engineer and the foundryman. Securable properties have been classified and specifications standardized so that the engineer can now ask for just what he needs with assurance that his castings will consistently meet his requirements. The machine tool industry is one that has already benefited from this progress and there is every indication that this useful step forward will considerably accelerate the enlarging opportunity for alloy cast irons with special physical requirements.

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THE extensive modernization programs in steel rolling mills have provided new opportunities for special irons for the reduction rolls as well as for run-out or conveyor rolls. American manufacturers of this equipment have attained world leadership because of the quality of their product. New records of performance in mining equipment and machinery for grinding and pulverizing in the ceramic industry have been made possible by the application of Ni-Hard to meet abrasive wear.

✦ ✦ ✦

Stainless Steels

SUCH rapid progress has been made in the uses of stainless steel that forecasts are difficult. Probably the trend is best indicated by the increasing use in air-

plane construction where the specifications are daily becoming more severe. Probably the most extensive factor of progress has been the development of manufacturing and fabrication techniques and the effective cooperation that large stainless steel producers have been able to extend to their customers.

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Cast Brasses and Bronzes

A TENDENCY to standardize on fewer types is outstanding in brass and bronze practice. Interesting developments have been an age hardening bronze containing 5% nickel which after heat treatment has high strength. The addition of 2% nickel to manganese bronze for propellers for high speed steamers has shown better resistance to cavitation. The Queen Mary and HMS Hood as well as other British war ships are facing their tasks with propellers of this alloy.

✦ ✦ ✦

Cupro-Nickels

THE year has brought increased use of 70-30 nickel for salt water lines and the necessary fittings where resistance to the corrosion of salt water is the outstanding requirement. Condenser tubes of this alloy in marine condensers are proving their economy over tubes of lower priced compositions.

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Nickel Silvers

IN England, and lately in this country, improvements in technique have made it possible to now extrude nickel silvers with a nickel content as high as 20%. These will considerably extend the scope of the architect's design for the use of white metals, as he was formerly limited to 13% and 15% nickel bearing alloys, depending upon the intricacy of the shape.

✦ ✦ ✦

Nickel Plating

FURTHER expansion in automatic processes and extension in the sizes that can be handled are really the basic developments of the year. The depositing of heavy nickel coatings (cold casting) has been used to build up worn surfaces. These have been produced up to ⅛" thick, with a Vickers hardness of 400. In contrast, has been the use of light coating (0.001") on steel, to prevent scaling during annealing. With the expanded use of bright plating has been a recognition of the relation of porosity to impurities in the bath and a consequent trend to rolled nickel anode.

✦ ✦ ✦

High Nickel Alloys

RAPID progress in the use of radiant tube type heat treating furnaces for normalizing, annealing and heat treating in steel mills has increased the use of high nickel alloys. In carburizing there has been some displacing of the cast boxes with a welded sheet construction and the development of continuous gas carburizing have increased the requirement for high nickel, high chromium alloys for the muffles and trays.

✦ ✦ ✦

INCREASING attention is being directed to the field of permanent magnet alloys. Alnico, containing aluminum, nickel and cobalt, and sponsored here by General Electric, is probably the best known of these alloys. Many new applications for Alnico have been found this year which give promise of expanding tonnage consumption of this alloy. Among these uses is a new ¼ horsepower motor with multipole armature, which automatically reverses its rotation when stalled, instead of burning out or blowing fuses. It is used on domestic washing machines to free clothing which may become jammed under the gyrating paddle. In the popular new portable radio sets the use of permanent magnets of this type in the loud speaker, considerably lengthens the life of the batteries.

✦ ✦ ✦

THESE high spots are selected from the year's developments because of their importance to industry and because they seem to indicate directions that future progress can be expected to take. Estimates of future trends necessarily involve individual opinions. It is, therefore, perhaps more helpful to delineate recent progress, so that engineers involved in design and construction can be judges of, and participants in, future trends.

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Rolled Nickel Alloys

THE uses of Monel, Nickel and Inconel are daily being expanded to meet the requirements of new trends, new applications and even new industries. Among the most interesting possibilities in the last group is television. This latest development in the science of communication has been a commercial reality for less than six months. Yet, already, it has shown marked progress. Within the past few weeks technical improvements have been such as to make possible the successful telecast of a baseball game.

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AS the new industry begins to hit its stride much of the early doubt with which it was surrounded in the public mind has begun to disappear. Sales of television sets definitely have started to mount.

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SINCE each television set contains from 16 to more than 30 tubes—many of them entirely dependent for satisfactory operation upon metal parts of pure nickel, they hold no small prospect for the nickel industry.

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TRANSPORTATION for years has formed one of the major outlets for nickel and nickel alloys. While the bulk of consumption by railroads, airplane, motorcar, and shipbuilders has been in the form of nickel irons and steels, a growing use is being made of rolled nickel and high nickel alloys of special characteristics such as Monel and Inconel.

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EVERYTHING seems to point to larger and faster airplanes for over-land as well as trans-oceanic service. Examples are found in the new clipper ships as well as the new DC 4 Douglas land planes ordered by United Airlines. Exhaust manifolds and cabin heaters

(*Please turn to Page 662*)

Outstanding Personalities of the Wire Industry

N. L. HITE
Sales Manager, Wire Division, Continental Steel Corp., Kokomo, Ind.

N. L. Hite and F. L. Hornbrook Promoted in Wire Division of Continental Steel Co.

N. L. HITE, since 1927, Assistant Sales Manager of the Wire Division of the Continental Steel Corporation, Kokomo, Indiana, has been appointed Sales Manager of the Wire Division. He succeeds William H. Childs, who retired October 1, 1939.

✦ ✦ ✦

APPOINTMENT of **Frank L. Hornbrook** as Assistant Sales Manager of the Wire Division, also was announced by Edmond P. Severns, Vice-President in charge of sales for the company. Mr. Hornbrook has been Assistant Sales Manager of the Manufacturers' Wire Division since 1929.

✦ ✦ ✦

MR. HITE has been identified with the organization for 33 years, starting his career with the Kokomo Steel & Wire Company in 1906. Following the merger of this company in 1927 with the Chapman-Price Steel Company, Indianapolis, Indiana, and The Superior Sheet Steel Company, Canton, Ohio, to form the Continental Steel Corporation, Mr. Hite became assistant Sales Manager of the Wire Division.

✦ ✦ ✦

MR. HORNBROOK began his career in the steel business in 1912, with the Hornbrook-Price Steel Company, which was organized by his father, H. H. Hornbrook. This company later became the Chapman-Price Steel Company.

✦ ✦ ✦

Captain E. M. Dixon

Air Corps, United States Army

CAPTAIN E. M. DIXON, Air Reserve Corps, United States Army, has been recalled to active duty with the Army and consequently has resigned as advertising manager of "WIRE & WIRE PRODUCTS".

✦ ✦ ✦

HE has been assigned as Executive Officer of the 152nd Observation Squadron, the 152nd Photo Section and Medical Detachment; also as Supply and Engineering Officer, Adjutant and Officer in Charge of Operations. The unit is a part of the 1st Corps Aviation, United States Army. When Federally recognized it will become a part of the Rhode Island National Guard. Captain Dixon will remain at that time as Federal Supervisor and Engineering Officer.

CAPT. E. M. DIXON
Air Corps, United States Army. Formerly Advertising Manager, Wire and Wire Products.

FRANK L. HORNBROOK
Asst. Sales Manager, Wire Division, Continental Steel Corp., Kokomo, Ind.

✦ ✦ ✦

CAPTAIN DIXON entered the military service as a private in 1917 and received an honorable discharge from the Army in 1919 as a Second Lieutenant, and was then commissioned in the Air Reserve Corps. He organized and was in command of the Aviation Unit of the New Jersey National Guard and has had eight years active Army duty in addition to that service. From 1930-34 he was in the U. S. Army Air Corps and from 1935 to 1937 served as Captain in command of a C.C.C. Camp. When the law limiting regular army and reserve officers in C.C.C. Camps became effective in the latter part of 1937, he automatically returned to his status as a Reserve Officer and entered the employ of "WIRE & WIRE PRODUCTS" as advertising representative, becoming Advertising Manager in the year following. Captain Dixon goes to his new army duty with our best wishes for his success and rapid promotion.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in August 1939 and August 1938
(In gross tons)

	AUG. 1939	JULY 1939	AUG. 1938
Wire rods	1,477	3,706	357
Strip steel	9,878	4,875	4,861
Plain, black or galvanized iron or steel wire	4,456	4,044	2,383
Barbed wire and woven wire fencing	3,651	4,791	3,265
Woven wire screen cloth	101	125	100
Wire rope	171	319	284
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	578	573	363
Wire nails	1,726	1,890	1,654
Tacks	32	18	13
Other nails, including staples	431	434	325
Bolts, machine screws, nuts, rivets and washers	570	630	565
Total, these 11 classifications	23,071	21,405	14,170

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete Reinforcement bars	330	20	248
Hollow bar and drill steel	129	206	56
Wire rods	775	727	220
Barbed wire	1,621	1,612	1,068
Round iron and steel wire	209	97	118
Telephone and telegraph wire	5	.....	1
Flat wire and strip steel	309	238	154
Wire rope and strand	113	141	156
Other wire	103	82	96
Hoops and bands	2,010	1,556	908
Nails, tacks and staples	614	838	831
Bolts, nuts and rivets	13	3	1
Total, these 12 classifications	6,231	5,520	3,857

Exports of Insulated Wire and Cable, August 1939

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Rubber covered wire	398,872	$ 94,562	96,171	$ 19,869
Weatherproof wire	220,880	32,085	73,936	11,962
Other insulated copper wire	479,250	99,505	148,170	27,072
Nickel-chrome electric resistance wire	30,489	32,150	.....	.....
Total, these 4 classifications	1,129,491	$258,302	318,277	$ 58,903

Scrap Trade Sharply Down

AT their second highest level of the year exports of iron and steel products from the United States in August totaled 185,182 gross tons valued at $13,282,599—a substantial increase over the July trade of 163,598 tons valued at $12,141,748 and topping the August, 1938, trade of 134,109 tons valued at $8,802,123 by more than 50,000 tons and $4,400,000.

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DESPITE the gains made by the August trade cumulative exports for the first eight months of 1939—1,272,055 tons valued at $95,678,644 — continue substantially smaller in tonnage (although greater in value) than the trade of the comparable period of 1938—1,388,819 tons valued at $93,949,678.

AUGUST imports decreased in volume to 24,599 tons but rose in value to $1,354,288 as compared to the July trade of 27,516 tons valued at $1,285,390. A year earlier—in August, 1938—imports amounted to 18,404 tons valued at $1,182,741.

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Tin Plate and Sheets Leading Export Items

TIN plate in point of tonnage again was the principal item of export in August—the 27,169 tons of this material exported including 4,040 tons sent to Brazil, 3,878 tons to the Netherlands, 2,594 tons to Canada, and 1,916 tons to Spain. Non-alloy black steel sheets was a close second with a total of 26,426 tons of which 5,266 tons went to Canada, 4,540 tons to the United Kingdom, 2,454 tons to Netherlands Indies, and 2,077 tons to Sweden. The trade in non-alloy "other" plates—19,371 tons—included 7,691 tons sent to Sweden, 2,657 tons to the Netherlands, and 1,275 tons to Canada. Exports of galvanized steel sheets—9,886 tons—went to the Philippine Islands, 2,529 tons, Finland, 1,412 tons, and Netherlands Indies, 1,216 tons.

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Canada Again Leading Purchaser

EIGHTY-THREE countries imported iron and steel from the United States in August with Canada the leading buyer. Shipments to that country totaled 34,701 tons and included 7,691 tons of skelp, 5,286 tons of non-alloy black steel sheets, 4,499 tons of plain structural shapes, and 3,353 tons of ingots. Shipments to Sweden amounted to 18,518 tons and included 7,691 tons of non-alloy "other" plates, 7,471 tons of pig iron, and 1,084 tons of tin plate. The 12,210 tons sent the Philippine Islands included 2,529 tons of galvanized steel sheets, 1,627 tons of concrete reinforcement bars, and 1,068 tons of tin plate, while of the 11,783 tons sent the United Kingdom 4,540 tons was non-alloy black steel sheets, 3,883 tons was non-alloy hot rolled strip, and 1,052 tons was wire rods.

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Scrap Exports Again Decline

TWICE in as many months scrap exports registered a decline in August—to a total of 291,896 tons including 290,346 tons of iron and steel scrap, 977 tons of tin plate scrap, 162 tons of tin plate circles, etc., and 411 tons of waste-waste tin plate. Japan continued to be the outstanding foreign market for this material, while the trade with such other leading markets as the United Kingdom, Italy, and Poland declined.

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Import Trade Again Declines

IMPORTS of iron and steel into the United States declined for the second consecutive month when, in August, but 24,599 tons of these products entered the country. Structural shapes—4,770

(*Please turn to Page 658*)

Exports and Imports of Wire

(*Continued from Page 657*)

tons—was the principal item imported and came from Belgium, 3,606 tons, and France, 1,144 tons. Pig iron ranked second with the bulk of the 3,204 tons received coming from British India, 2,211 tons, and Canada, 993 tons. Cotton ties—2,939 tons—were had chiefly from Germany, 1,788 tons. Norway — 1,967 tons — was the principal source of the 2,355 tons of ferro-manganese received, while Belgium was the largest factor in the 2,163-ton trade in bars whether solid or hollow and the 2,010-ton trade in "other" hoops.

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Wood Screws

EXPORTS of iron and steel wood screws during August, 1939, totaled 25,821 gross valued at $5,484. Of this total, the United Kingdom took 9,047 gross valued at $2,731; Cuba, 3,937 gross valued at $487; Guatemala, 3,537 gross valued at $455; Canada, 2,356 gross valued at $605; Republic of Panama, 1,622 gross valued at $252; Mexico, 1,234 gross valued at $147; Venezuela, 1,109 gross valued at $242; Dominican Republic, 680 gross valued at $120.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 6,896 gross valued at $3,446. Of this total the United Kingdom took 1,568 gross valued at $737; Venezuela, 1,278 gross valued at $564; Republic of Panama, 1,133 gross valued at $779; Mexico, 770 gross valued at $217; Cuba, 356 gross valued at $109; Panama Canal Zone, 324 gross valued at $112; Brazil, 262 gross valued at $45.

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IMPORTS of wood screws during the same month totaled 17,112 gross valued at $1,669, supplied by Belgium, 17,000 gross valued at $1,646; Canada, 100 gross valued at $17, and Denmark, 12 gross valued at $6.00.

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Award of Annual Medal by The Wire Association

(*Continued from Page 642*)

outmoded because of scientific advancements in communication and travel since his time; on the other hand today we declare ourselves as upholding the Monroe Doctrine. The relation in time between Washington's advocation against European entanglements and President Monroe's" declaration is the same relation of time as between World War No. 1 and the present World War No. 2.

✦ ✦ ✦

OUR sympathies are naturally with our Canadian neighbors! It is thoroughly believed, however, that this nation should remain neutral.

✦ ✦ ✦

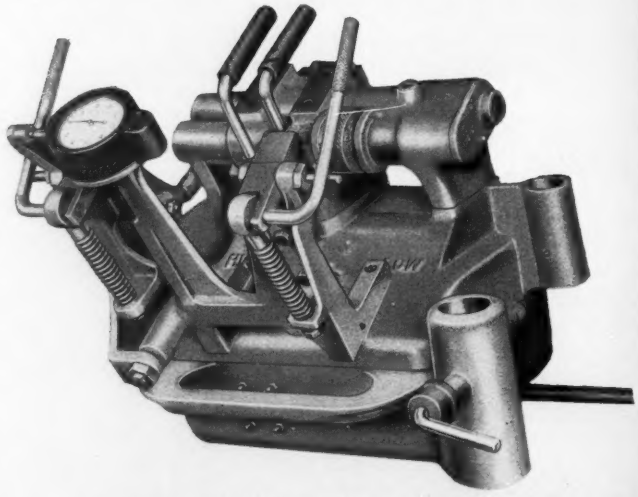
AT the same time we should build our national defenses adequately in the air and in the Army

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



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Capacity #20 to #4 W & M gage high and low carbon wire.

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Telephone, State 7468

and Navy, to a point sufficient to maintain a formidable position against any nation that might challenge our Monroe Doctrine and the Constitution of the United States, as we interpret it today and as we and our forebears fought and shed our blood for.

✦ ✦ ✦

Conclusion

IN conclusion, may I state that the Wire Association is progressing in great strides. This is demonstrated by the excellent quality of our papers and the technical researches presented at our Annual and at our Regional Meetings. Let us not stand still, but continue to be as resourceful and drive as hard in the future for the betterment of this association as we have in the past.

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TODAY we carry through on the foundation laid in the administrations of our past presidents,—the late John Mordica of Bethlehem Steel Corporation, whom we have memorialized by the Mordica Memorial Lecture; and Ralph K. Clifford, vice president of Continental Steel Corporation, who has donated much of his time and ability to forward our activities. Our Executive Secretary, Major Richard E. Brown, has truly been always an indefatigable worker, coordinator and cooperator; J. Kenneth Beeson of Pittsburgh Steel Corporation and Sydney Rolle of Scomet Engineering Co. carried the heavy responsibilities as chairmen of the Program Committees for this 1939 convention, and they have performed a grand job for all of us.

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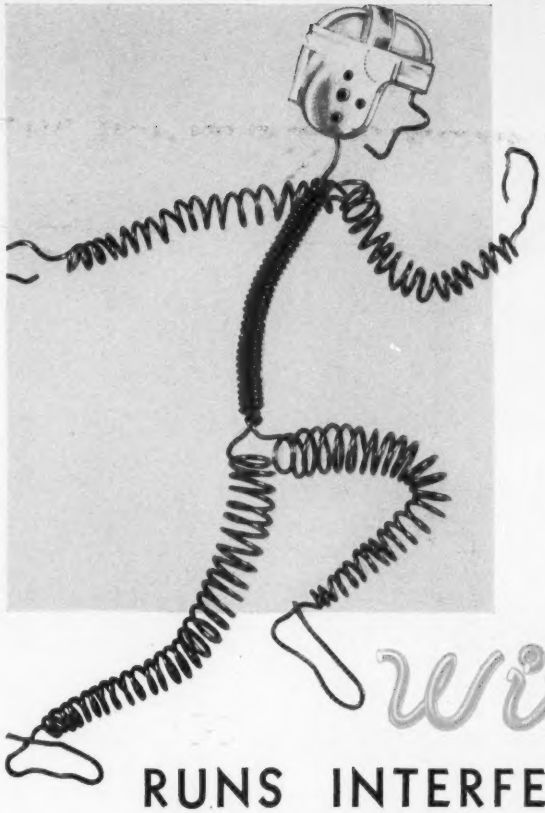
LASTLY, I wish to extend Godspeed to you all, that you may have prosperity, success in your undertakings, and good health. Let's hope we may all be spared to be present next year in Cleveland for our Annual Convention, and as well our Regional Meetings of 1940.

For Information Regarding The Wire Association Address

Richard E. Brown, Secretary
300 Main Street, Stamford, Conn.



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KEYSTONE

STEEL & WIRE CO., Dept. W, PEORIA, ILL.

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Bright . . . Tinned
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EASY TO OPERATE
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It's a fact that practically all the lead encased cable manufacturers in the U. S. and Canada and in many foreign countries are equipped with Robertson Presses!

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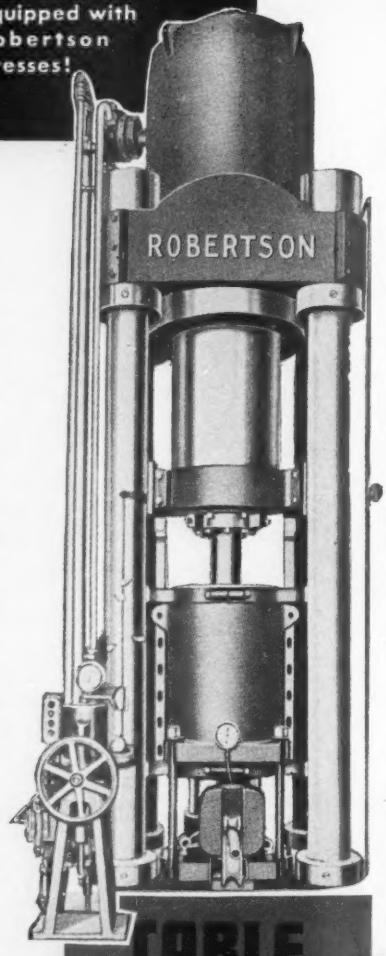

The widespread acceptance of the Robertson Press is easy to understand: It is of heavy construction, accurately built. It is designed to withstand the highest pressures required for the work. It is easy, economical to operate. (In the largest size, the main hydraulic ram may be repacked in not more than two hours by two men.) All working parts are guided carefully so that perfect alignment may be maintained at all times.

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'Round the World With the Wire Industry

Greece Interested in American Steel

THE office of the American Commercial Attache at Athens reports that Greek interest in importing American steel products continues unabated, but is largely futile because of lack of import permits. From January 1 to June 7 permits totaling 26,000,000 drachmas (about $224,000) were issued for American products divided as follows: Pig iron, steel billets and slabs, $28,000; Merchant iron, wire rods, strips and hoops, $50,600; and iron and steel sheets, black and galvanized, steel plates, tin plate and terne plate, $145,000. Manufacturer-importers were the recipients of the above permits since the number of the applications of merchant-importers was so large that any attempt to prorate global quotas among all applicants would have resulted in the issuance of permits for amounts too small to be usable. In June interest centered upon American plates, galvanized sheets, tin plate and blue annealed sheets—the first named being especially sought for shipbuilding and repair and because the American product is currently available at about $45 per metric ton c.i.f. against the $65.50 asked for the German equivalent. Further, deliveries from Germany are both slow and in limited quantities.

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New Plant in South Africa

APPROXIMATELY £4,500,000 will be spent on South Africa's new steel plant which, it is planned, will be set up at some unannounced point (possibly near Vereeniging) but away from Pretoria. The proposed plant, which will be "As big as, if not greater than Iscor", is expected to give employment to perhaps as many as 2,000 "Europeans" when in full operation. ("Sunday Times", Johannesburg, June 4, 1939).

Iscor May Make Wire

ALL wire for ordinary use is at present imported into the Union of South Africa. It is now proposed, however, that this situation be corrected through the establishment at Iscor (South Africa Iron and Steel Industrial Corporation, Ltd.) of a wire drawing department. The proposal is reported still in the formative stage. (Rand Daily Mail, June 9, 1939).

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Showa Works to Further Expand

SO important has the Showa Steel Works at Anshan, Manchukuo, become to the local government that the enterprise is to be given "special" status. The fifth and sixth stages of the expansion program of this "Works" were recently announced and call for the expenditure of an additional £622,240,000 on new equipment which would increase the present pig iron capacity by 1,360,000 metric tons to 3,060,000 tons, add 500,000 tons to the present 580,000 tons of steel ingot capacity (this addition being accomplished in the third and fourth stages of the expansion program) and a further 1,750,000 tons under the fifth and sixth stages. This extensive program, which is to be completed under present plans by the end of 1942, will make it necessary to secure from local collieries approximately 6,400,000 tons of coal annually, something which even the Japanese papers appear doubtful of, so that dependence may have to be placed in securing at least a part of this tonnage from the Kailan Mining Administration in North China. (Office of the American Commercial Attache, Tokyo).

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IN view of the war condition in Europe, it might be interesting to note the remarks contained in a letter from the Dijon, France office of the Globe Wire Dire Co. "Regarding our works, it has no change and we continue to sell dies to all our customers in allied or neutral countries. Our works are running fully now with all workers and employes. From the above you will note that despite the conditions prevailing, our people are operating their factories fully, and in position to fill all orders for Diamond and Carbide Dies."

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Copperweld Steel Co. to Build New Plant

THE Copperweld Steel Company of Glassport, Pa., makers of patented wire, will erect a $2,000,000 electric steel plant at Glassport, Pa. The plant will have a capacity of 100,000 tons of alloy steel per year.

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
Stamford Trust Co. Bldg.
300 Main St. Stamford, Conn.

THESE

STEVENS FLANGED STEEL DRUMS

ARE USED BY MANY WIRE & CABLE MANUFACTURERS.

FOR

ALL I. P. C. E. A. AND SPECIAL SIZES AND CAPACITIES OF THIS TYPE SHIPPING REEL.

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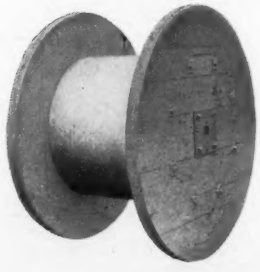

WRITE FOR DETAILS

Made in Low Carbon Steel for Standard Weight and in High Carbon and Alloy Steels for Special Light Weight Drums.

Galvanized — Painted — Plain Finishes

STEVENS METAL PRODUCTS CO.

NILES, OHIO

Continuous Wire Annealing in Open Gas Flames

(*Continued from Page 645*)

appropriate portion of it in the meantime having adhered to the wire streaking by. Beyond the tinning bore, but still in the heat zone, is a wiping device of ingenious though simple design. It consists of no more than a long spring, held between end blocks, as in figure 5, through which the wire passes. Although no single one of the 40 small convolutions of this spring wipes the complete circumference of the wire, there are so many coils that excellent wiping is obtained all around the wire before the complete spring length has been traversed. The burnishing device, just outside of the tinning furnace and in the open air, is an identical spring.

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THE tinning furnace itself is also gas-fired from the rear by the immersion tube principle for highest thermal efficiency. The unit is sufficiently wide to handle six wire lines at once from a common tin pot of one-half to one ton capacity. In the latest models, the tin is pumped through a gear pump at less than one pound per square inch pressure.

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Cleanliness of Bright-Anneal Proved by Enamel Applications

EXHAUSTIVE tests have proved that the new open flame units produce a most acceptable uniformity of anneal. Further tests have clearly demonstrated the cleanliness of the surface of the bright annealed wire delivered. Practical proof may be found in the successful application of Syncro open-flame anneal equipment to continuous wire enameling operations wherein the newer synthetic enamels are applied to the wire. Wire, to be enameled with these new synthetic products, must be almost chemically clean to insure good adhesion of the coating rather than a mere deposition of an organic "sleeve".

Fig. 5. A simple device, but one which effectively wipes (in the heat zone) or burnishes (outside of the heat zone) at high speeds. ✦ ✦

✦ ✦ ✦

ANY consideration of the new **Syncro** continuous open-flame annealer as a whole, reveals two significant characteristics: (1) that it adapts the mechanical principles of "automatic machinery" to a job heretofore considered only in terms of "furnaces", and (2) that it represents a complete production line composed of a sequence of separate ingenious elements or building blocks, each flexible in its own function but capable of being used in various combinations with other elements to adapt the new principle of open-flame heat treatment to a wide range of ultimate wire products and individual plant requirements. These characteristics, coupled with the continuity, speed, control, and economy the apparatus brings to wire annealing, should assure its future as a profitable new tool for the non-ferrous metal industry.

Recent Trends in the Further Uses Of Nickel Alloys

(*Continued from Page 655*)

nel because of its resistance to hot, corrosive exhaust gases whose natural enmity to metals is increased by higher and higher engine horsepowers. Each of the clipper ships uses about 1200 pounds of Inconel.

✦ ✦ ✦

ON board ship new uses for Monel have been developed, which with the increased activity in American shipyards will require thousands of pounds of this alloy. Among these uses are refrigerator linings, for which Monel has proved especially adapted since it resists corrosion and readily can be kept in a clean and sanitary condition.

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NEWER materials such as "K" Monel, a heat treatable alloy with mechanical properties rarely obtained in a non-ferrous material, is likewise apt to benefit from increased shipbuilding. It has many uses from pump shafts and sleeves to valve discs and steams in high temperature steam lines. A recently developed use of "K" Monel which also holds promise is for corrosion-resistant ball, roller, and other types of bearings exposed to corrosive attack.

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FROM the marine field comes another development that promises additional tonnage in that field, in other fields of transportation and in industrial plants. This is the use of nickel for linings of all kinds especially in the handling of rayon quality caustic soda. This development was given impetus within recent months by the use of 60,000 pounds of nickel for lining the holds of a cargo boat. Plans are already underway for the lining of tank cars and storage tanks. Lined tanks in the form of nickel-clad steel, of course, are generally used in a variety of industries.

✦ ✦ ✦

NEW achievements in the fabrication of nickel and nickel alloys are being noted. At the New York World's Fair a pure nickel tube 26/1000 of an inch in diameter is on display. This is believed to be the smallest metal tube ever yet produced and its manufacturers are discussing the production of an even smaller size, though as yet such tubes have little or no commercial use. They serve to illustrate, however, the extent to which modern fabrication methods have progressed.

✦ ✦ ✦

EVEN the modern brewery may be transformed by replacing historic materials with while metals. Forerunner of such a possibility is found in Sudbury, Ontario, where the Sudbury Brew-

(*Please turn to Page 665*)

A Review of Recent Wire Patents

No. 2,171,546, SURFACE PREPARATION, Patented September 5, 1939 by Walter R. Kappes, Oakmont, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa., a corporation of Pennsylvania.

The invention relates to the treatment of aluminum and aluminum base alloy surfaces preparatory to applying a firmly adherent coating of paint, enamel or the like, by etching the surface with an alkali metal carbonate-chromate solution, and then removing the oxide deposited, leaving the etched surface exposed.

✦ ✦ ✦

No. 2,172,037, WIRE-WEAVING MACHINE, Patented September 5, 1939 by Frank F. Schmiege, Kalamazoo, Michigan.

More specifically, the inventor aims to prevent the pucker or "climb" of the cloth roll when winding wire mesh into rolls, by providing a device engageable between the cloth on a roll and the strip of incoming cloth about to be wound on the roll, so that the incoming cloth will be flat thereon.

✦ ✦ ✦

No. 2,172,112, WIRE FENCE, Patented September 5, 1939 by William H. Sommer, Peoria, Ill., assignor to Keystone Steel & Wire Company, Peoria, Ill., a corporation of Illinois.

In triangular mesh wire weaving, the inventor weaves the woof, or cross-wires, of continuous single strands, back and forth from one selvage to the other, of whatever height the fence may be, each woof wire being wrapped around each selvage wire and around each intermediate warp or line wires.

✦ ✦ ✦

No. 2,172,134, APPARATUS FOR STRAIGHTENING WIRES AND RODS, Patented September 5, 1939 by Albert Frederick James Wright, Walthamstow, London, England.

Automatic means is provided to control the idle rotation of the straightening dies about the wire, thus tending to prevent heating, chafing and subsequent breakage of the wire. There are 13 claims to this patent.

✦ ✦ ✦

No. 2,172,171, PRODUCTION OF BRIGHT COPPER, Patented September 5, 1939 by Walter R. Meyer, Milford, and Michael F. Dunleavey, Bridgeport, Conn., assignors to General Electric Company, a corporation of New York.

The bath employed consists of an aqueous solution of, by weight, from 80 to 20 parts concentrated sulphuric acid, from 20 to 50 parts concentrated nitric acid, a chloride in an amount equivalent to from 0.1 to 10 parts concentrated hydrochloric acid and from 5 to 200 parts chromic acid.

✦ ✦ ✦

No. 2,172,388, STAINLESS STEEL, Patented September 12, 1939 by Albert L. Kaye, Hammond, Ind., and Robert S. Williams, Belmont, and John C. Wulff, Cambridge, Mass., assignors to The Chemical Foundation, Incorporated, New York, N. Y., a corporation of Delaware.

Stainless steel of the 18-8 type is provided, resistant to pit corrosion, by performing on the surface a continuous film of an insoluble silver compound, originating from silver contained in the steel. There are 14 claims.

✦ ✦ ✦

No. 2,172,483, MEANS AND METHOD FOR ASSEMBLING THE INDIVIDUAL SPRINGS OF SPRING UNITS, Patented September 12, 1939 by George E. Taylor, Chicago, Ill., assignor to Samuel E. Sosna, and George E. Taylor, as trustees.

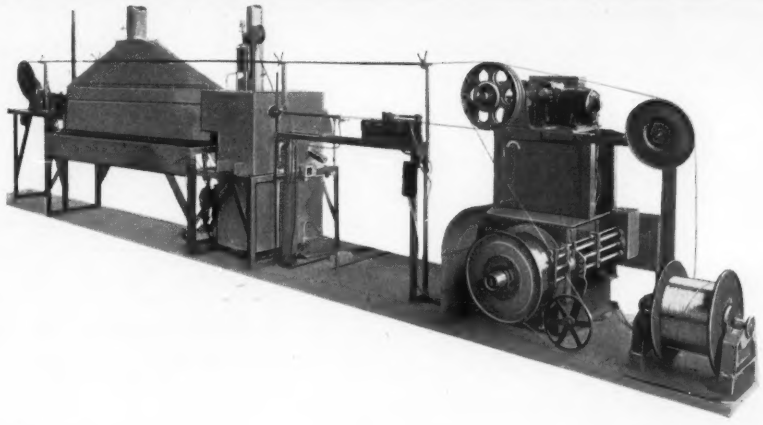
This inventor states that the primary object of the invention is to accurately advance helical retainers such as are employed for interconnecting adjacent wire springs in spring units, in an amount determined by the spacing of the overlapping portions of one set of adjacent springs from the overlapping portions of adjacent sets.

✦ ✦ ✦

No. 2,172,760, ELECTRIC CABLE, Patented September 12, 1939 by Samuel J. Rosch, Yonkers, N. Y., assignor to Anaconda Wire & Cable Company, New York, N. Y., a corporation of Delaware.

A new drain conductor is provided for cables of the multi-wire type, with the drain feature not interfering with flexibility of the cable.

(Please turn to Page 664)



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Write for descriptive literature.

SYNCRO

Syncro Machine Company

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Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto.

A Review of Recent Wire Patents

(Continued from Page 663)

No. 2,172,837, APPARATUS FOR TREATING STRANDS, Patented September 12, 1939 by Waldemar C. Ewaldson, Millington, and Heinz Kress, North Plainfield, N. J., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The apparatus is intended for treating textile material-covered wires with a solution of cellulose acetate or the like.

✦ ✦ ✦

No. 2,172,945, CABLE MANUFACTURING APPARATUS, Patented September 12, 1939 by George A. Seeley, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

This device is adapted for assembling a group of wires on slotted washers to form a cable composed of wires, spaced one from another. There are 18 claims.

✦ ✦ ✦

No. 2,173,091, ARMATURE AND COIL WINDING MACHINE, Patented September 19, 1939 by Dale Armstrong, Washington, D. C.

Particular attention has been paid to preventing the wire from piling up and provide evenly wound layers of wire.

✦ ✦ ✦

No. 2,173,707, SQUARE SOCKET SCREW WITH SIDE SLOTS, Patented September 19, 1939 by Frank K. Brown, South Dartmouth, Mass., assignor to Continental Screw Company, Bedford, Mass., a corporation of Mass.

This inventor describes this socket-winch or screw driver turned screw as an invention improvement upon the screw described in his prior U. S. patent No. 2,082,748, of June 1, 1937, the slots in the head of the screw being differently formed.

✦ ✦ ✦

Heat-Treated Gears for Industrial Use

A COMPLETE line of heat-treated gears for heavy-duty industrial application has been announced by the Westinghouse Electric & Manufacturing Company. These gears, heat treated by the Barnes process (BP), are especially designed for long life and dependability under adverse operating conditions, such as in cranes, mine hoists, locomotives, and in rubber, flour, cement, quarrying, and metal-mining machinery.

✦ ✦ ✦

HEAT treatment by the BP method gives the gears a hard wearing surface, tapering off on the inside to an extremely tough core. This characteristic of the process produces not only long wearing gear teeth, but also high shock resistance because of the tough core.

✦ ✦ ✦

GEARS in this new line ordinarily have approximately 4 times the life of an untreated gear or pinion under the same service and operating conditions. The rate of wear is nearly constant throughout useful life. Additional information may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

This is an invitation for you to become a member of The Wire Association. ✦ ✦ ✦ ✦ ✦ ✦

The Annual Dues are $10.00

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Richard E. Brown, Secretary

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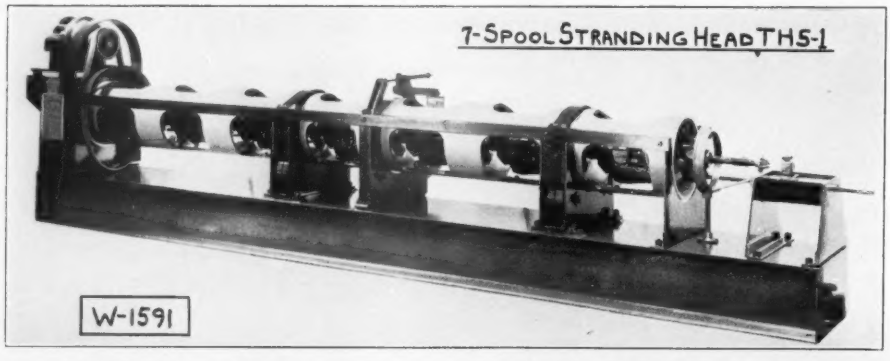

ELECTRICAL WIRE, CABLE & WIRE ROPE MACHINERY

Printed Literature Available On Considerable Of The Equipment Used In These Fields—Inquiries Are Invited

Recent Trends in the Further Uses of Nickel Alloys

(*Continued from Page 662*)

ing and Malting Company, Ltd., recently completed a thorough renovation of its plant and installed brewing kettles and other equipment of nickel and nickel-clad steel.

✦ ✦ ✦

NICKEL and nickel pipe lines were used also for this installation. Where it was found more expedient to make certain ornamental and other castings out of brass, such castings were nickel plated before installation.

✦ ✦ ✦

ANOTHER alloy, which like "K" Monel combines the corrosion resistance of nickel and high nickel alloys with the mechanical properties of the higher strength ferrous alloys, is "Z" Nickel. Like "K" Monel, it can be heat treated. Since it is an alloy of relatively recent development, its full possibilities have not completely been explored. It has been found highly useful for springs and other small parts, particularly in electrical equipment. Research and experimental applications now under investigation indicate that many possibilities of this alloy will be realized within the next year.

✦ ✦ ✦

THE chemical and food and other processing fields, of course, continue to offer a wide range of markets for Nickel, Monel, Inconel, and their associated alloys. The increasing use of plastics of all kinds presents an exceptional range of opportunities since pure nickel is essential for many items of storage and processing equipment in plastic production. As indicated, the production of rayon with its need for caustic soda free from harmful metallic contamination still grows in its demands for nickel and nickel-clad steel.

✦ ✦ ✦

THE use of clad materials, incidentally, has shown a trend of growing strength. Included are both Inconel-clad and nickel-clad steel plate and rolls of a variety of materials covered with Nickel, Monel and Inconel sheet.

✦ ✦ ✦

VARIOUS government projects —planned or now under construction—will account for some large tonnages in this group of nickel alloys. Outstanding among these is the new Fort Peck Dam, being built by the U. S. Army engineers for flood control navigation purposes on the Missouri and Mississippi Rivers. The huge valve gates—almost 30 feet in diameter —which will control water flow are equipped with valve seats of heavy Monel forgings.

✦ ✦ ✦

ALMOST the entire roll of industry could be called in this fashion. And almost the entire list would reveal some important development in which some product of the nickel industry will make an important contribution.

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- **Increased speed of drawing wire**
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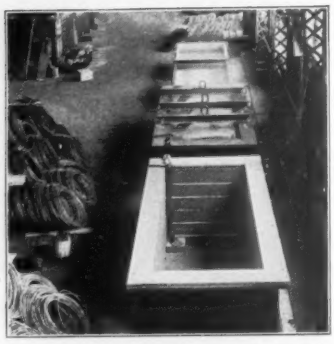
heat, agitate, circulate pickle liquors



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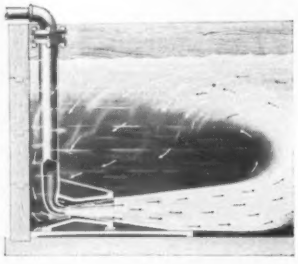

Write for Bulletin No. 1801 which contains information on Steam Jets, Ejectors, Tank Outlets, and a chart to determine jet and steam requirements.

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Used in place of diamond dust it reduces the cost of shaping, ripping and finishing.

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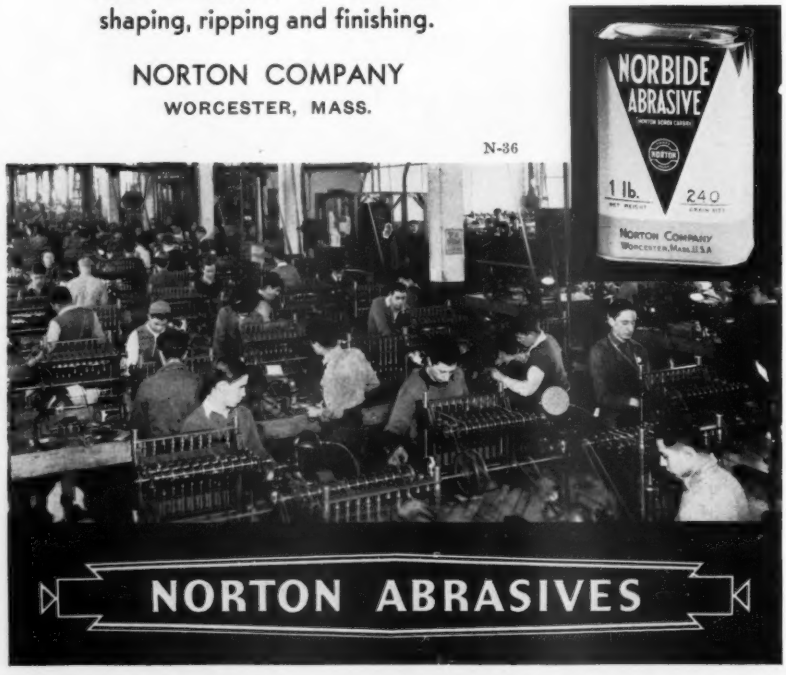

Back-Pull Patent Issued

(*Continued from Page 648*)

said strip tensions, and means responsive to variations in the effective diameter of the unwinding reel for modifying the action of said torque varying means.

✦ ✦ ✦

A STRIP mill comprising a roll stand provided with reducing rolls, strip reels to which opposite ends of a strip extending between the reducing rolls are attached, a motor geared to each reel, each motor being adapted to drive its reel to wind the strip thereon and to be driven by its reel while the strip is unwinding therefrom, means operated by said strip and connected to one of said motors to vary the torque thereof upon a variation in the ratio of the strip tensions on opposite sides of the rolls to maintain a substantially constant ratio between said strip tensions and means operated by said strip and operably connected to said torque varying means to modify the action thereon in accordance with changes in the effective diameter of one of said reels.

✦ ✦ ✦

A STRIP mill comprising a roll stand, strip pulling means at one side of the roll stand, strip retarding means at the opposite side of the stand, a member controlled by the tensions in the strip on opposite sides of the roll stand and movable in response to a change in the ratio of said tensions, and means controlled by said member for varying the tension of the strip to the rear of the roll stand to maintain a substantially fixed ratio between said tensions.

✦ ✦ ✦

IN a strip mill, the combination with the roll stand and devices on opposite sides of the roll stand for applying tension to the strip, of means for maintaining a substantially fixed ratio between the tensions to which the strip is subjected on opposite sides of the roll stand comprising a device for measuring the ratio of the strip tensions on opposite sides of the roll stand and means operated by

said measuring means for controlling one of said tension applying devices.

✦ ✦ ✦

IN a strip mill, the combination with the roll stand and devices on opposite sides of the roll stand for applying tension to the strip, of means for maintaining a substantially fixed ratio between the tensions to which the strip is subjected on opposite sides of the roll stand comprising a control for one of said tension applying devices sensitive to variations in the tension of the strip on the side of the roll stand opposite to that of the controlled tension applying device.

✦ ✦ ✦

FURTHER information regarding the process may be obtained from George D. Hartley, consulting engineer, 311 Main St., Worcester, Mass.

✦ ✦ ✦

Wire in War

(*Continued from Page 640*)

is a problem requiring mutual assistance and an effective solution. The time is ripe for critical scrutiny of all of our joint planning and more particularly, a recheck of all accepted schedules of production. The final plans evolved must be capable of execution and sufficiently flexible to be correlated to contemporaneous conditions. The national defense must be based upon the proper utilization of the Wire Industry. I am certain that the nation can count on all of you one-hundred per cent in any emergency.

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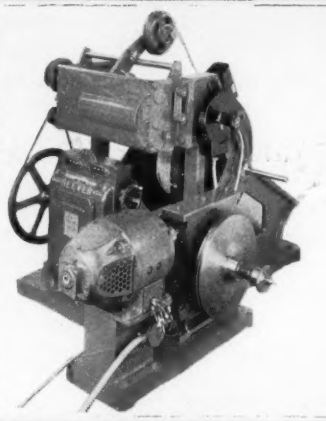

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Traverse guide adjustable for width of wire being insulated and variable tension take up provided.

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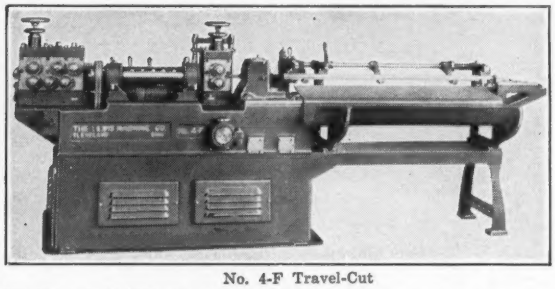

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RODINE, added to the pickling bath, saves acid and metal, minimizes brittleness, and lowers pickling costs. Standard the world around.

CUPRODINE creates a denser, tighter, brighter and more uniform coating, in less time. Provides better lubrication for drawing than ordinary copper coating.

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New Standards Approved by American Society for Testing Materials

AMONG the many new standards approved by the American Society for Testing Materials at their annual meetings, the following information retaining to wire and allied products may be of interest to the wire industry.

✦ ✦ ✦

Ferrous Metals

OF the 13 recommendations which had been approved by letter ballot of Committee A-1 on Steel following its Atlantic City meeting, nine were proposed new tentative specifications, six of which resulted from work inaugurated during the past year in the field of spring wire—for which there has been a lack of standardized specification requirements. The new spring wire specifications cover the following: hard-drawn spring wire (A 227-39 T), oil-tempered spring wire (A 229-39 T), music spring wire (A 228-39 T), chromium-vanadium spring wire (A 231-39 T), carbon valve spring quality wire (A 230-39 T), and chromium - vanadium valve spring quality wire (A 232-39 T). Tensile properties of the wire vary from 150,000 psi. to 440,000 psi. depending upon the diameter, composition, etc.

✦ ✦ ✦

Non-Ferrous Metals

IN the field of non-ferrous metals, recommendations from Committee B-1 on Copper and Copper-Alloy Wires for Electrical Conductors were approved covering new tentative specifications for soft rectangular copper wire (B 48-39 T) to replace immediately the existing standard (B 48-38). The new tentative specifications recognize two classes of rectangular wire, one class being suitable for all applications except possibly those involving extreme edgewise bending, and the other class being particularly applicable for edgewise bending purposes. A bending test is incorporated in the proposed specifications for this latter class of material, in place of the tension

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test prescribed for the other class of material. Elongation values for the tension test prescribed are increased and certain modifications are made in the permissible variation of dimensions in order to bring these requirements more nearly in line with present practice in the industry.

✦ ✦ ✦

SPECIFICATIONS covering flat commercial rolled nickel-copper alloy for purposes for which material of this composition is applicable (B 127-39 T) were approved by the Society on the recommendation of Committee B-2 on Non-Ferrous Metals and Alloys. Material which has a nickel range of 63.0 to 70.0 per cent is considered suitable for the general run of drawing, forming, stamping, bending, and joining operations. The tensile strength for annealed, ¼ hard, and hard, stress-equalized classes of cold-rolled sheet and strip are, respectively, 70,000 to 80,000 psi., 75,000 to 85,000 psi., and 100,000 psi., min. Tensile range for plate (¼ in. thick and heavier) is 7,000 to 85,000 psi., in annealed condition.

✦ ✦ ✦

Metallography—Grain Size

BECAUSE of the rules governing the preparation of micrographs of metals and alloys including recommended practice for photography as applied to metallography (E 2-36) were in need of revision, having stood unchanged for three years, the committee in charge, E-4 on Metallography, as a result of intensive work during the past year submitted proposed tentative rules which replace the existing standard and which will carry the designation E 2-39 T. Changes were rather extensive and it was felt a new standard was desirable to replace the older one. These rules which are of wide spread service cover such items as standard magnifications, reproduction of micrographs, lenses, method of measurement of grain size, use of grain size in specifications. In the section on recommended practice for photography as applied to metallography, the material is divided into the following: magni-

(*Please turn to Page 670*)

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WIRE NAIL MACHINERY

These machines are made in eleven different sizes. This enables us to cover any size of nail most efficiently.

GLADER Nail making machines have been adopted as standard equipment in all recent major nail mill installations.

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✦ ✦ ✦

HAVE you a patent, a process or even a workable idea of value to the Wire Industry?

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REPRESENTATION on a straight fee or royalty percentage basis.

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BOX 112

WIRE & WIRE PRODUCTS

Stamford Trust Bldg.
STAMFORD, CONN.

New Standards Approved by American Society for Testing Materials

(*Continued from Page* 669)

fications, lenses, illumination of specimens, photographic materials.

✦ ✦ ✦

THE proposed tentative standard for classification of austenite grain size in steel which carries the designation E 19-39 T will replace the existing items, E 19-33 and E 19-38 T. The new standard makes use of the present two sets of charts, one of them in idealized form, intended to be used with any procedure for determining austenite grain size, the other consisting of a series of photomicrographs showing the structures found in the carburized case in a carburizing (McQuaid-Ehn) test. These two charts cover the same range of sizes, with identical designations (Nos. 1 to 8), the use of the one or the other being a matter of individual preference. The manner of making the grain size test may of course determine which chart will be used.

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BELLIS Salt Annealing Equipment for annealing rods and wire.

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American Welding Society Elects Officers

AS a result of counting the ballots recently sent out in connection with the election of officers for 1939-1940, the following nominees will be formally inducted into office at the Annual Meeting of the Society in October of this year: President, G. T. Horton; First Vice-President, T. C. Smith; Second Vice-President, L. S. Moisseiff; District Vice-President — New York and New England — W. F. Hess; Middle Eastern, L. C. Bibber; Middle Western, K. L. Hansen; Southern, A. J. Moses; Pacific Coast, L. W. Delhi. Directors-at-large: E. W. David, J. D. Gordon, G. F. Jenks and H. S. Smith.

✦ ✦ ✦

THE By-Laws provide that if no nominations, other than proposed by the Committee, are made by 25 qualified members, then the Secretary shall treat the nomination ballots as Election Ballots and certify the results to the Presiding Officer at the Annual Meeting.

✦ ✦ ✦

New Carboloy Torch Brazing Bulletin

CARBOLOY Company, Inc., Detroit, manufacturers of cemented carbide tools, dies and wheel dressers, has issued a bulletin giving the latest methods of torch brazing Carboloy tools.

✦ ✦ ✦

THIS bulletin gives suggestions as to materials required, shank preparation, tip preparation braze assemblies, methods of cooling, designs for enclosed tips, and braze assemblies for special and multi-point tools.

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ANNOUNCING A SPECIAL ISSUE FOR JANUARY, 1940

SPECIAL BECAUSE:

The discussions on technical papers at the annual meeting of the WIRE ASSOCIATION will be published in their entirety in the regular January issue of WIRE and WIRE PRODUCTS.

✦ ✦ ✦

The directors of the WIRE ASSOCIATION have approved this plan to provide these discussions to all subscribers without extra expenditure.

✦ ✦ ✦

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Monsanto Chemical Co., Rubber Service Laboratories Div., St. Louis, Mo.
National Oil Products Co., Harrison, N. J.

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Syncro Machine Co., Rahway, N. J.
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Magnus Chemical Co., Garwood, N. J.
Monsanto Chemical Co., Akron, Ohio.

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National Oil Products Co., Harrison, N. J.

COILERS—Sheet, Strip and Wire
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H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

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Entwistle, James L., Pawtucket, R. I.

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CRANES—Wire Mill
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Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM WIRE DRAWING—
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DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

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Cochaud Wire Die Co., New York, N. Y.
Globe Wire Die Co. (M. V. Dreyspool), New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Inc., Irvington, N. J.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
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Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
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Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
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Vaughn Machinery Co., Cuyahoga Falls, O.

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DRUMS—Vulcanizing
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Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
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Syncro Machine Co., Rahway, N. J.

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Torrington Mfg. Co., The, Torrington, Conn.

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Syncro Machine Co., Rahway, N. J.
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John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

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Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

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Watson Machine Co., Paterson, N. J.

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Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
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Torrington Mfg. Co., The, Torrington, Conn.

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Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

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National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine, Rahway, N. J.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Inc., Newark, N. J.
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
National Rubber Machinery Co., Akron, O.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
Synero Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OVENS—Industrial
Carl-Mayer Corp., Cleveland, Ohio.

PACKING—Tannate Leather
Rhoads & Sons, J. E., Philadelphia, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Monsanto Chemical Co., Akron, Ohio.
National Oil Products Co., Harrison, N. J.

PIPING AND FITTINGS—Acid Resistant
Duriron Co., Inc., The, Dayton, O.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Synero Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Vanco, Co., The, Manchester, Conn.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Corp., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Entwistle, James L., Providence, R. I.
Scott Co., Henry L., Providence, R. I.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
H. J. Ruesch Machine Co., Newark, N. J.

TURKS HEAD—
Standard Machinery Co., Auburn, R. I.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE DRAWING—High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Stainless Steel—
Firth-Sterling Steel Co., McKeesport, Pa.

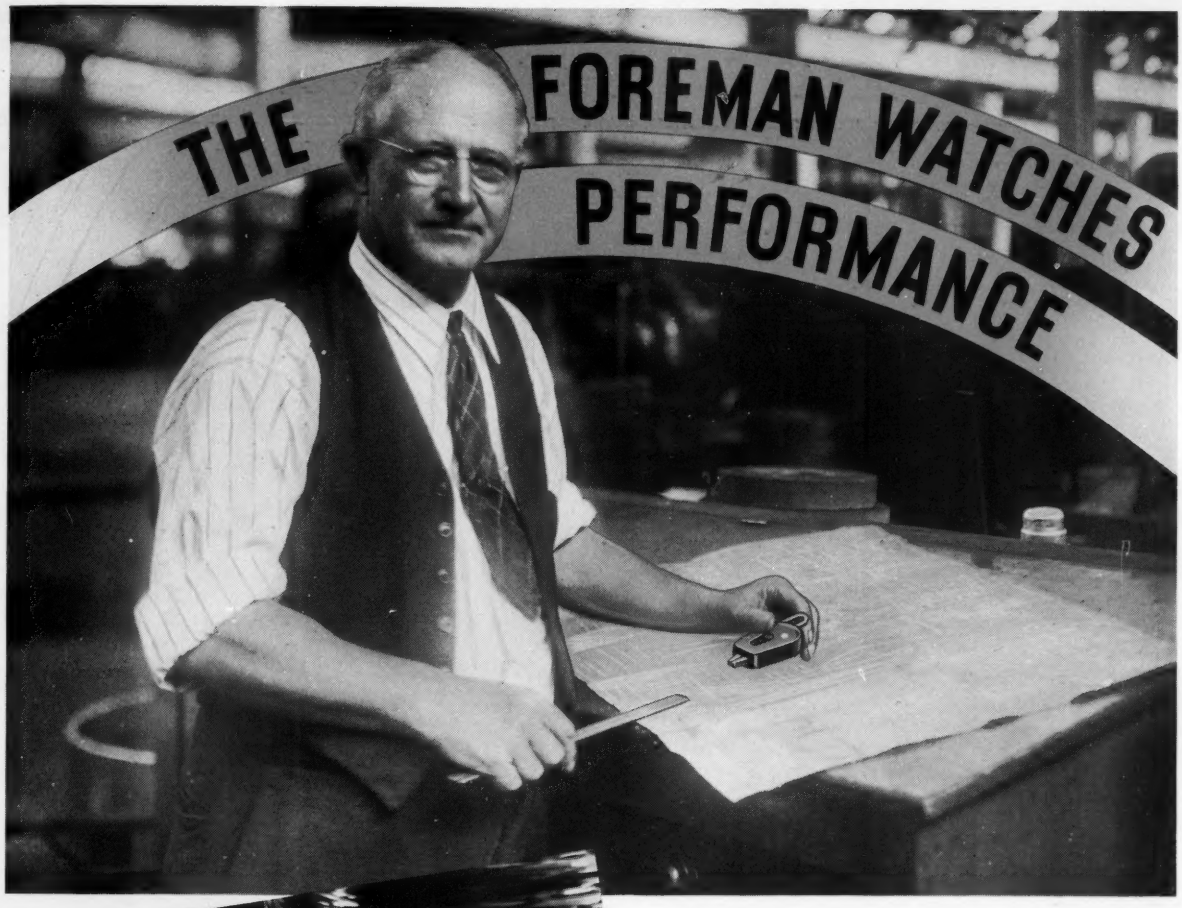
WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

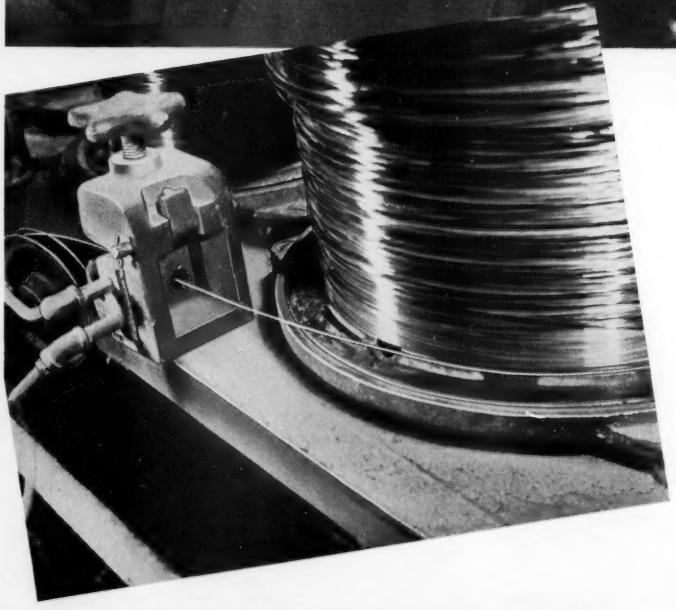
WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.





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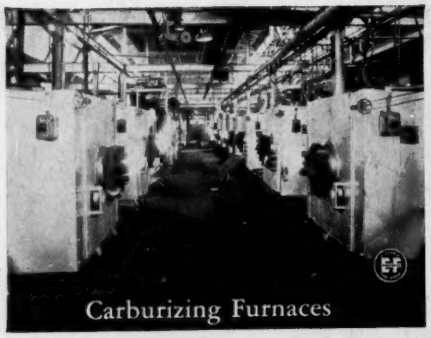
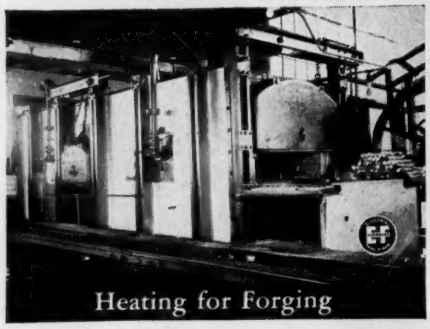
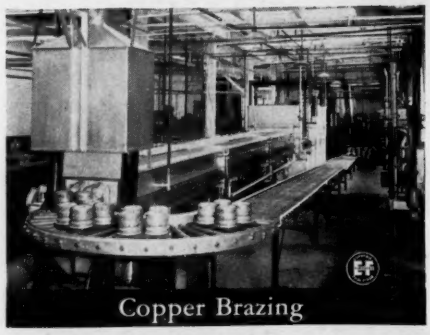


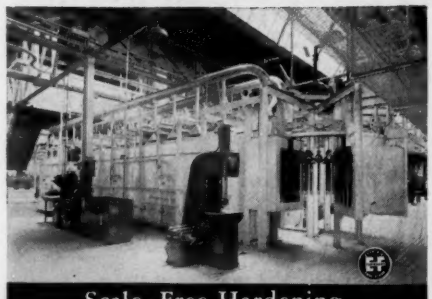
Carburizing Furnaces



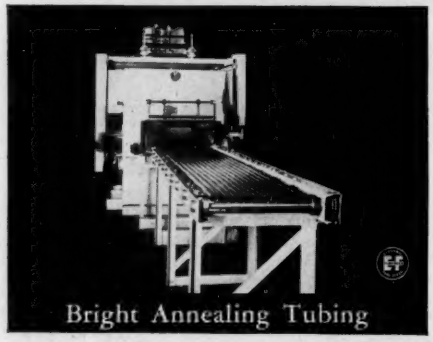
Heating for Forging



Copper Brazing



Scale-Free Hardening



Bright Annealing Tubing